

MARINE NATURE CONSERVATION
AND SUSTAINABLE DEVELOPMENT

The Irish Sea Pilot



REPORT TO DEFRA BY
THE JOINT NATURE
CONSERVATION COMMITTEE

**JOINT
NATURE
CONSERVATION
COMMITTEE**

defra
Department for Environment
Food and Rural Affairs


**Isle of Man
Government**
Kolligys Eilan Vannin

REVIEW OF MARINE NATURE CONSERVATION

FINAL REPORT OF THE IRISH SEA PILOT

STATEMENT OF ENDORSEMENT BY MEMBERS OF THE IRISH SEA PILOT STEERING GROUP

The Review of Marine Nature Conservation (RMNC) was established in 1999 in fulfilment of the Government's pledge to accompany the strengthening of protection for terrestrial wildlife sites with an examination of the effectiveness of the system for protecting nature conservation in the marine environment.

In March 2001, the Review's Working Group published an Interim Report (Defra, 2001) which set out a number of recommendations for further work. One of these was to test, through a pilot scheme, the regional seas approach to marine nature conservation management and to develop recommendations for a refined framework for marine nature conservation in UK waters.

On 1 May 2002, the Secretary of State for Environment, Food and Rural Affairs announced the Government's intention to proceed with the pilot scheme recommended in the Interim Report. On 21 May 2002, Defra and the Joint Nature Conservation Committee (JNCC) signed a Service Level Agreement which authorised JNCC to undertake the work agreed by the Review's Working Group. Work commenced on the pilot on 21 May 2002 and concluded on 3 March 2004. The pilot was supported by a Steering Group drawing on a wide range of interests.

This Report presents the conclusions of the Irish Sea Pilot. It was prepared by the Pilot's Project Team and was subject to detailed consideration by members of the Pilot's Steering Group.

The work was undertaken by JNCC through its Pilot Project Team and through work commissioned from a wide range of contractors with expertise in a variety of disciplines. The Report's findings were the subject of detailed consideration by the Steering Group during the course of the project and in the drawing up of the final Report.

The Project Team has endeavoured to reflect in the Report, a consensus opinion emerging from the project's findings and from the views expressed by the Steering Group. The conclusions are however those of the authors. The Steering Group acknowledges that the Report presents an accurate summary of the work undertaken through the Pilot project, and the lessons learned. The Steering Group is satisfied that the authors' conclusions are soundly based in that work, although they may not fully reflect the views of all members of the Group, some of whom may have reservations about specific aspects.

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On 21 May 2002, Defra and JNCC signed a Service Level Agreement which authorised JNCC to undertake the work set out in the specification for the Regional Seas Pilot Scheme agreed by the Review of Marine Nature Conservation Working Group. This Agreement enabled JNCC to incur expenditure and enter into contractual arrangements, including the employment of staff to the Pilot's Project Team. The management of the Pilot's Project Team and implementation of its work programme was overseen by a Steering Group of interested stakeholders. The opinions expressed in this report are those of the Pilot's Project Team.

Funding for the Irish Sea Pilot was provided by Defra but additional funds were provided by the Countryside Council for Wales, the Environment and Heritage Service, the Government of the Isle of Man and the Joint Nature Conservation Committee.

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We wish to thank staff in the Government of Ireland, Isle of Man and Devolved Administrations who provided advice to the Pilot, comment on interim reports and assisted with the stakeholder workshops. Also thanks to the Departments, Agencies, Marine Institutes and Laboratories in Ireland and the Isle of Man who gave valuable time to provide data and advice.

The overall guidance to the Pilot was provided by the Steering Group (membership Appendix 1), under the chairmanship of Linda Smith (Defra). The Project Manager Dominic Whitmee provided helpful day to day advice with administrative support from Naomi Keeble, Martin Willcox and Christine Rumble. JNCC provided technical assistance to the Pilot in various ways (Appendix 2).

We are grateful to all the consultants (Appendix 3) who did research under contract often at short notice and within tight deadlines.

The Pilot team was hosted by English Nature's Cumbria Team at its Kendal office. Thanks to Team Manager Des O'Halloran for providing accommodation and helping us feel a part of the Cumbria Team. Our thanks also to all these individuals and groups who have collaborated to make the Pilot genuinely a team effort.

Malcolm Vincent, Project Director
Steve Atkins, Team Leader
Chris Lumb, Senior officer
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January 2004

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The cover shows a scuba diver exploring the reefs off the coast of the Isle of Man. This biological community, just below the kelp zone, is dominated by sea urchins, plumose anemones and sponges. Scuba diving is a growing recreational activity in the UK. © John Gulland.

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EXECUTIVE SUMMARY

1. *Introduction.* The purpose of the Irish Sea Pilot was to help develop a strategy for marine nature conservation that could be applied to all UK waters and, with international collaboration, the adjacent waters of the north-east Atlantic. The work fulfils a commitment made by the UK Government in May 2002, at the launch of *Safeguarding our Seas*, and was funded primarily by Defra with contributions from other partners.
2. A proposed framework for marine nature conservation, developed as part of Defra's Review of Marine Nature Conservation, envisaged the need to take action at a range of scales. These scales were i) the Wider Sea, ii) the Regional Sea, iii) Marine Landscapes, and iv) Nationally-important habitats and species. The proposed framework anticipated that a range of measures would be needed to conserve marine biodiversity, including protected areas, spatial planning and other measures. The Pilot tested the practicality and potential method of operation of the proposed framework and the additional measures needed to put it into effect. This Report makes 64 recommendations. The work and its main findings are summarised below.
3. *Data and Information.* The appropriate management of the marine environment is dependent on adequate information and data. The Pilot collated geophysical, hydrographical, nature conservation, ecological and human use data and used GIS analysis. While intertidal and near-coast biological information was found to be satisfactory, data were sparse for most offshore localities to a degree which would constrain good decision-making. Furthermore, some survey data were not available to the Pilot, either because they were held in an inappropriate format or because the data owner was unable or unwilling to release it. The principal conclusions are:
 - a national marine information network should be established to which marine data should be contributed using agreed data standards;
 - all marine data collected with public funds, and environmental data collected by the private sector for the purpose of complying with a regulatory procedure, should be placed in the public domain within specified timescales;
 - improved co-ordination of data collection and research activities needs to be achieved, and there should be a greater degree of collaboration between survey organisations.
4. *The Wider Sea.* The seas make an important contribution to the economy and quality of life of the United Kingdom through their contribution to a wide range of human activities. The regulation of many of these activities is determined or influenced by international Conventions and by European Union legislation. The principal conclusions are:
 - there is a need to ensure that international and national policy, legislation and financial incentive measures support, and do not frustrate, the achievement of the strategic goals set for the marine environment;
 - human activity should be managed effectively at the national level to achieve the maintenance, or restoration, of good ecological conditions, and the conservation and sustainable use of the marine environment;
 - a national system of co-ordinated environmental monitoring, together with the monitoring of human activities, should be implemented.

5. *Regional Sea.* Boundaries for a series of UK Regional Seas are proposed, determined initially in terms of biogeography. They provide an appropriate scale at which to map and describe biodiversity and at which to manage human activities within the marine environment. The principal conclusions are:
 - a system of biogeographical Regional Seas should be developed for the north-east Atlantic;
 - these Regional Seas, their boundaries modified as necessary to facilitate human activity management, should be considered as a basis for marine strategic planning and management;
 - consideration should be given to the establishment of fora at the Regional Sea level to improve co-ordination and collaboration in management planning, data collection, survey and research.

6. *Marine Landscapes.* The Pilot tested the concept of 'Marine Landscapes' which is based on using geophysical and hydrographical data to identify habitat types in the absence of biological data. If reliable, such an approach would enable management measures for offshore areas to be developed with confidence in the absence of biological data, which is very expensive to obtain in offshore areas. The Pilot successfully applied this approach to the Irish Sea, identifying and mapping 18 coastal and seabed marine landscape types, and 4 water column marine landscape types. The principal conclusions are:
 - the marine landscape approach should be adopted as a key element for marine nature conservation, and utilised in spatial planning and the marine environment;
 - a list of internationally-agreed marine landscapes for the north-east Atlantic should be developed, and work to map these should be undertaken in collaboration with other countries.

7. *Nationally-important marine features.* A draft set of criteria for the identification of nationally-important marine landscapes, habitats and species was tested. The principal conclusions are:
 - the criteria, somewhat modified in the light of experience gained in the testing, could be adopted by the UK for the identification of nationally-important marine landscapes, habitats and species;
 - further work should be undertaken to determine which marine nationally-important features would benefit from specific Action Plans, and a unified process (incorporating the work undertaken under the UK Biodiversity Action Plan) should be operated.

8. *Nationally-important marine areas.* The Pilot investigated the concept of ecologically-coherent networks of important marine areas as envisaged under the EC Habitats Directive and under OSPAR, tested draft criteria for the identification of important marine areas, and investigated a range of methods to develop a network of areas for the Irish Sea. The principal conclusions are:
 - the identification and appropriate management of an ecologically-coherent network of important marine areas is a crucial element of the framework for marine nature conservation;
 - such a network, using the principles identified in the Report, should be identified at the Regional Sea level. The test criteria, slightly modified, are appropriate for the identification of areas within these Regional Sea networks;
 - appropriate measures should be taken to manage areas within the network, including, for selected examples of the main habitat types, measures which will ensure that the areas develop and sustain the full range of biodiversity characteristic of those habitats.

9. The Pilot also investigated means of identifying and conserving important marine geological and geomorphological areas, an aspect previously little considered in the UK or internationally.
10. *Conservation objectives.* Building on the vision and strategic goals set out in *Safeguarding our Seas* and *Seas of Change*, a generic series of high level conservation objectives and operational conservation objectives applicable to national waters was formulated. The principal conclusions are:
 - the conservation objectives identified should be integrated into a single, unified, set of national strategic goals and objectives for the marine environment and its sustainable development;
 - a process should be established to identify and set appropriate targets for each operational conservation objective which are consistent with the strategic goals and with achieving international and national commitments.
11. *Overarching Measures required.* Mechanisms by which the Regional Sea could be managed to achieve the conservation objectives at the various scales of the proposed framework for marine nature conservation were considered in relation to current measures and legislation. The principal conclusions are:
 - a statutory process of marine spatial planning involving national planning guidelines, strategic plans at the Regional Sea scale, and more detailed local plans should be introduced;
 - additional legislation is needed to ensure that an ecologically-coherent network of nationally-important areas can be established and conserved;
 - the European Commission should clarify the means of achieving the effective regulation of fishing in nationally-important areas, including European marine sites, beyond 6n miles;
 - national legislation should be introduced to control and reduce the killing, injury and disturbance of cetaceans and certain other vulnerable species, as a result of fishing and other activities;
 - fisheries decisions and activities should be brought within the scope of Strategic Environmental Assessment plans and programmes and also within the scope of plans and projects in relevant European Union legislation;
 - adequate conservation measures for non-quota commercial species should be developed at national and European levels. The Community action plan to reduce discarding should be implemented in full.
12. *Enforcement and Governance.* The Pilot reviewed existing enforcement measures and governance systems as they affect marine nature conservation. The principal conclusions are:
 - the responsibility for the enforcement of marine nature conservation should be made explicit;
 - the authority(ies) responsible for enforcing marine nature conservation should have, or have access to, the requisite powers and the necessary vessels and other resources necessary to carry out the enforcement effectively. Effective collaborative and co-ordination arrangements for enforcement agencies operating in the marine environment should be put in place;
 - a Cabinet committee or other cross-departmental authority should be established to take overall responsibility for strategic planning in the marine environment. Departmental and agency responsibilities for the marine environment should aim to achieve increased efficiency and effectiveness.

13. *Marine nature conservation framework and follow-up work.* From the experience gained during the project, the Pilot has revised the proposed Marine Nature Conservation Framework. The attached report provides a specification for applying the framework to other Regional Seas, and identifies further work in relation to the Irish Sea. Finally, the Pilot identified the work needed to develop a national marine strategic and spatial planning system. The principal conclusions are:
 - the revised marine nature conservation framework set out in the report should be adopted for the UK and promoted with other countries in the north-east Atlantic;
 - resources should be sought from relevant national jurisdictions and statutory agencies, and from the European Union, to complete the work to apply the marine nature conservation framework to the Irish Sea, and to develop detailed proposals for a comprehensive marine strategic and spatial planning framework following a trial of initial proposals on the Irish Sea.
14. *International working.* While the foregoing conclusions are intended to apply directly to the United Kingdom, one of the main conclusions of the Pilot was the importance of working closely with international Government partners and stakeholders. This will be crucial in the effective future management of the national seas and adjacent waters.
15. *Other outputs.* This report includes advice from 23 separate commissioned studies. Further reports will be produced including:
 - Communications with stakeholders
 - Data collation and mapping
 - Classification of marine landscapes
 - The identification of nationally-important habitats, species and areas
 - The development of conservation objectives
 - Marine legislation and enforcement
 - Applying spatial planning to the marine environment

1. MARINE NATURE CONSERVATION AND SUSTAINABLE DEVELOPMENT

1. The Irish Sea Pilot was undertaken to help develop a framework for marine nature conservation within a wider strategy for sustainable development in the marine environment. Such a framework would need to operate at a range of scales, from global to local, including at the scale of the biogeographic ecosystem (the 'Regional Sea'). Regional Seas in the north-east Atlantic area normally include waters within the jurisdiction of several countries. For this reason, it is hoped that the Irish Sea Pilot will be of interest and value to other countries. The policy context and background to the Pilot are summarised below.
2. On 1 May 2002, the Secretary of State for the Environment, Food & Rural Affairs launched the United Kingdom Government's Report *Safeguarding our Seas: A strategy for the conservation and sustainable development of our marine environment* (Defra, 2002a). The Report aimed to address the United Kingdom's international and European Union commitments to the conservation and sustainable development of the marine environment based on an ecosystem approach.
3. One of the important components of the developing strategy initiated through the publication of *Safeguarding our Seas* was the need to develop a framework for marine nature conservation set in the context of sustainable development. Such a framework would incorporate international obligations for nature conservation, particularly those arising from the UK's membership of the European Union, and contribute to delivery of the EU's marine thematic strategy.
4. During 2000, a draft framework for marine nature conservation was proposed by English Nature, and supported by the UK statutory nature conservation agencies and the Joint Nature Conservation Committee (Laffoley *et al.*, 2000). The geographical scope of the draft framework extended from high water mark out to the limits of UK jurisdiction. For the seabed, this is the area designated in accordance with the Continental Shelf Act, 1964, and, for the water column, the area included within British fishery limits.
5. The proposed framework for marine nature conservation was one which could, with any necessary amendment and their agreement, be extended to the marine environment of neighbouring countries. It is summarised below.

Draft Framework for Marine Nature Conservation

6. The draft framework for marine nature conservation had four main elements. These were:
 - i. *The Wider Sea*

The Wider Sea includes all seabed and overlying waters under UK jurisdiction, together with those of adjacent waters. Issues such as pollution, water quality, wide-ranging marine species and environmental change, would be addressed at this level;
 - ii. *Regional/subRegional Seas*

Regional Seas were to be ecologically meaningful subdivisions of the Wider Sea. Such medium-scale marine ecosystems were envisaged as the appropriate scale within which to map and describe biodiversity, identify conservation priorities, and manage human activities in accordance with sustainable development principles;
 - iii. *Marine landscapes*

Within each Regional Sea, geophysical and hydrographical data would be used to map the main types of 'marine landscapes' present, their constituent biological communities would be identified or predicted, and their sensitivity to a range of human activities assessed. The degree to which human activity needed to be managed in order to conserve each of the various marine landscapes could then be assessed and any necessary management put in place. Some marine landscape types might require a strict level of protection, others less so;

iv. Habitats and species

Habitats and species which were both nationally-important and also potentially sensitive to human activities would be the subject of special measures (in addition to those required under European legislation for habitats and species of international importance). Such measures would be likely to include the identification of areas within which potentially-damaging human activities would be strictly regulated.

At the Regional Sea level, it was expected that the conservation requirements of marine landscapes, habitats and species could be addressed, at least in part, through a system of human activity zoning and spatial planning.

The Review of Marine Nature Conservation

7. The background to the development of the draft framework for marine nature conservation was the Review of Marine Nature Conservation which was established in 1999 in fulfilment of the UK Government's pledge to accompany the strengthening of protection for terrestrial wildlife sites with an examination of the effectiveness of nature conservation in the marine environment, including intertidal and coastal waters. The Review was conducted initially by officials of the former Department of the Environment, Transport and the Regions, and subsequently of the Department for Environment, Food & Rural Affairs (Defra), supported by a Working Group drawing upon a wide range of interests.
8. While recognising that the draft framework could well prove extremely valuable for marine nature conservation, the Review of Marine Nature Conservation Working Group acknowledged that it was largely untried in practice, and considered that it should be trialled through a Pilot to determine whether it could be implemented or whether it needed to be modified. It would be important in such a trial to balance nature conservation needs with those of the wide variety of human activities that occur in the marine environment.
9. In March 2001, the Working Group published an Interim Report (Defra, 2001) in which it set out a number of recommendations for further work. One of these recommendations was that: 'Based on the work of the [UK nature conservation] agencies and JNCC, and in consultation with other marine regulators and users, the Regional Seas approach should be tested through a pilot, at the regional sea scale, which could demonstrate the application of the regional seas/marine landscapes concept and examine how far the conservation management needed within the pilot area could be delivered through existing systems. The pilot may well need further work, on which the agencies and the Working Group could advise, to explore the possibilities in detail. It should ensure that it involved all relevant interests and trial the best means to secure their on-going involvement at this scale. The outcomes of the pilot would be recommendations as to a refined framework for marine nature conservation in UK waters, and the legislative and administrative actions that were needed to implement it' (Paragraph 147 iii of the Interim Report).
10. The Interim Report made a number of other recommendations which were highly relevant to the proposed Pilot. These included:
 - i. 'There is a need to draw together the identification of those habitats, sites and species which are nationally-important and which justify conservation action.' (Paragraph 147 ii);
 - ii. 'they [JNCC and country nature conservation agencies] should investigate the development of a comprehensive UK marine landscape classification and propose marine landscapes targeted for conservation action.' (Paragraph 147 v);
 - iii. 'An exercise should be mounted by Government which seeks to identify best practice in marine enforcement both here and abroad, including both methods now available in this area, and common approaches in relation to regulators' relationships to sea users.' (Paragraph 147 viii);

- iv. 'Government should give consideration to whether any changes in the governance of marine issues might need to follow from action to implement the conclusions of this Report, for example to ensure that the devolved administrations are properly engaged in marine matters and to address those matters where the UK's competence is shared.' (Paragraph 147 ix).
- 11. During 2001, the Working Group developed a detailed costed specification for work proposed under the Pilot, which also aimed to support and trial aspects of the work specified in paragraph 10 above. The Working Group recommended that the Pilot be undertaken on the Irish Sea because it was of appropriate scale, was relatively well-documented, and because all the UK administrations and relevant agencies would be able to participate in the work. Potentially, and with their agreement, it would also be possible to involve other Governments, namely the Governments of the Isle of Man and of the Republic of Ireland, thus testing the international aspect of managing a Regional Sea.
- 12. On 1 May 2002, the Secretary of State for the Environment, Food and Rural Affairs announced the Government's intention to proceed with the Pilot scheme recommended in the Interim Report.
- 13. On 21 May 2002, Defra and the Joint Nature Conservation Committee (JNCC) signed a Service Level Agreement which authorised JNCC to undertake the work set out in the specification for the Pilot agreed by the Review of Marine Nature Conservation Working Group. This agreement enabled JNCC to incur expenditure and enter into contractual arrangements, including the employment of staff, for that purpose. Work effectively commenced on the Pilot on 21 May 2002 and was scheduled to be concluded within 21 months.

2. THE IRISH SEA PILOT

14. **Objectives:** The overall purpose of the Pilot was to 'Test the recommendations identified by the Interim Report of the Review of Marine Nature Conservation Working Group'. In particular, the objectives of the Pilot were to:
- i. test the framework proposed by the paper *An implementation framework for the conservation, protection and management of nationally-important marine wildlife in the UK* [Laffoley *et al.*, 2000];
 - ii. test ways of integrating nature conservation into key sectors in order to make an effective contribution to sustainable development on a regional basis;
 - iii. determine the potential of existing regulatory and other systems for delivering effective marine nature conservation and identify any gaps;
 - iv. recommend measures to fill the gaps identified.
15. In developing the specification for the Pilot, the Review of Marine Nature Conservation Working Group had sought to implement the ecosystem approach recommended in *Safeguarding our Seas* (Defra, 2002a), following the principles adopted by the Convention on Biological Diversity (Convention on Biological Diversity, 2000). In effect, the Pilot intended to apply the ecosystem approach to the development of strategy and policy in the nature conservation sector, but sought to integrate this with policies for other sectors.

Work Programme

16. The work programme was designed as a number of discrete but complementary tasks. These are summarised below:
- i. developing and implementing a communications strategy to inform and involve stakeholders;
 - ii. collating and mapping information on the physical and biological characteristics of the Irish Sea, its natural resources and human activities;
 - iii. handling, analysing and mapping essential data on GIS;
 - iv. developing a marine landscape classification for the Irish Sea using geophysical and hydrographical information, and describing the biological communities of these, validating predictions by new survey where necessary;
 - v. testing draft criteria for the identification of nationally-important habitats and species;
 - vi. testing draft criteria for the identification of nationally-important areas, and developing appropriate methodologies for this;
 - vii. developing nature conservation objectives relevant to the various levels of the framework for marine nature conservation having regard to the needs of other sectors;
 - viii. reviewing existing legislation, governance and enforcement mechanisms against the conservation objectives;
 - ix. assessing the potential contribution of the framework for marine nature conservation to sustainable development;

- x. reviewing the scope of the Pilot specification in relation to its use for other Regional Seas, and also the scope of the framework for marine nature conservation;
 - xi. evaluating the Pilot project in relation to its application to other Regional Seas and to stakeholder perceptions of the work undertaken;
 - xii. estimating the cost of completing a nature conservation strategy for the Irish Sea.
17. The full work programme is available online at www.jncc.gov.uk/irishseapilot.

Budget

18. The budget provided by Defra to JNCC for undertaking work on the Pilot through the Service Level Agreement was £397,200 covering the 21 months from May 2002.
19. To this was added a contribution by JNCC from its own budget for the purpose of undertaking the work on nationally-important areas and nationally-important habitats and species for which existing provision had been made in JNCC's work programme. The value of this contribution was £34,400.
20. During the course of the Pilot further funds were made available to enable the Pilot to extend its work to cover additional aspects not originally included in the Pilot specification. These were work on aspects of the Pilot in relation to the Isle of Man, and work relating to the conservation of important areas for marine geology and geomorphology. The value of these funds was £37,800.

Organisation of the Pilot

21. Work on the Pilot commenced at the United Kingdom level, but, during the summer of 2002, approaches were made to the Governments of the Isle of Man and of Ireland inviting them to participate in the project.

Steering Group

22. The work of the Pilot was overseen by a Steering Group chaired by Defra and comprising representatives of the Government of Ireland, the Government of the Isle of Man, the devolved administrations, relevant statutory agencies, representatives of the fishing industry and of other industries, and conservation NGOs. The organisations represented on the Steering Group are given at Appendix 1.
23. During the course of the Pilot the Steering Group met 7 times, and considered progress of work and expenditure against the timetable and budget set out in the specification. The Steering Group also determined any necessary changes to the specification and balance of expenditure, and considered the conclusions and recommendations arising from the work.

Project organisation

24. Overall responsibility for the management of work undertaken through the Pilot was vested in JNCC's Project Director. The day-to-day management of the work was the responsibility of a JNCC Project Team. By agreement with Defra, recruitment to the Project Team was undertaken by the assignment of existing staff of the statutory nature conservation agencies, and through the recruitment of support staff.
25. Following a recruitment exercise, the Project Team started work at the end of June 2002, based at English Nature's office in Kendal, Cumbria. The Project Team received technical and scientific

support from JNCC's permanent staff based in Peterborough and Aberdeen. This support was provided on a part-time basis. A list of the staff engaged in the Pilot is given at Appendix 2.

26. The work of the Project Team, and of the JNCC staff assigned to the Pilot, was supported by work commissioned from a variety of contractors. In total, 23 contracts were let and information relating to these is provided at Appendix 3.
27. In addition to the individual contributions made to the Pilot by the Members of the Steering Group during meetings and also intersessionally, other support was provided which significantly assisted the Pilot. The Centre for Environment, Fisheries and Aquaculture Science (CEFAS) provided revised fish nursery data and assisted with the collation and mapping of fisheries data obtained by the Project Team from fisheries organisations. Data were contributed by the Government of Ireland, and also by the Government of the Isle of Man who also provided support for an analysis of legislation, regulation and enforcement for the Isle of Man. The Countryside Council for Wales, the Environment and Heritage Service and the Government of the Isle of Man contributed financially to work undertaken to identify areas of geological and geomorphological importance in the Irish Sea.

3. COMMUNICATIONS STRATEGY

Development of the Strategy

28. One of the first tasks to be undertaken by the Pilot was the development of a communications strategy. Consideration of the purposes of communications for the Pilot enabled the production of a defined set of objectives. These were to:
- i. inform those people who were likely to have an interest in the Pilot about its purpose, timescale, progress and conclusions;
 - ii. help in the identification of sources of information essential to the successful operation of the Pilot;
 - iii. ascertain the views of stakeholders in order to help refine objectives formulated as part of the proposed framework for marine nature conservation, both to ensure that they were the most appropriate objectives for nature conservation, and also to help ensure they were compatible with meeting the wider needs of people for the Irish Sea;
 - iv. help to refine conclusions as to the measures necessary to enable the objectives to be met including in relation to effective regulation, regulatory responsibility and enforcement;
 - v. promote the outcomes of the Pilot, outside the UK, with the European Commission, other countries bordering on the North-east Atlantic and with OSPAR.
29. The staff time and other resources available to the Pilot for implementing the communications strategy were limited, and the most cost-effective means practicable needed to be used when communicating with the intended audiences. Following a preliminary investigation with a cross-section of stakeholders, the following communications strategy was adopted:
- i. a stakeholder database was to be established and maintained, containing the email and, where appropriate, postal addresses of stakeholder contacts;
 - ii. a website was to be established and maintained. All the main consultation documents and task reports produced by the Pilot were to be posted on this website;
 - iii. bulletins, in the form of an Irish Sea Pilot Newsletter, were to be produced periodically, and widely disseminated, and articles would be submitted for inclusion in the newsletters of other organisations;
 - iv. presentations were to be given to selected workshops, seminars and conferences. These presentations were to be given in the circumstances where, either a large number of stakeholders could be reached at one time (often where the conference had been organised for purposes other than the Pilot), or where a workshop had been specifically organised so as to engage a small number of key stakeholders actively;
 - v. bilateral meetings were to be held with stakeholders whose contribution to the Pilot or its outcomes was deemed to be critical;
 - vi. links were to be maintained with the range of other Government initiatives arising from the publication of *Safeguarding our Seas* (Defra, 2002a).
30. The primary means of active communication with stakeholders was to be by email, using the contact list held on the stakeholder database.

Implementation of the Communications Strategy

31. At the commencement of the Pilot, the decision was taken to focus communication with stakeholders at the international, national, regional and 'county' levels, with local stakeholders being accorded a lower priority. This was in recognition of the purposes of the Pilot, and the level of resources available. The stakeholder database was developed from existing contact lists, but these were refined and added to during the life of the Pilot. Initially, the database contained information on 200 contacts; by the end of the Pilot, with stakeholders from Ireland and the Isle of Man included, this had risen to 700.
32. A component of the JNCC website was developed for use by the Irish Sea Pilot, namely **www.jncc.gov.uk/irishseapilot**. All the main documents produced by the Pilot were posted on the website. Because some of these documents were large, and many included maps, this proved a better means of making such information available to stakeholders than emailing it, which could quickly have resulted in the capacity of their email systems being exceeded. Notification of the placement of documents on the website was circulated by email.
33. Three Irish Sea Pilot Newsletters were produced. The first announced that work was underway on the Pilot, the second was a progress report, and the third announced completion of the Pilot and summarised its results. These Newsletters were disseminated firstly to the stakeholder contacts, secondly through the mail service offered by *Coastal Management for Sustainability* (some 2,000 contacts), and thirdly through the website.
34. Articles on the Pilot were published in *Wavelength*, *Biodiversity News*, *Coastline Scotland* and in *Coast Map News*.
35. During the course of the Pilot, some 40 presentations were given to a range of international, national and regional audiences, totalling some 2,700 people. Stakeholder workshops were organised in the Isle of Man, Edinburgh, Cardiff, Liverpool and an all-Ireland workshop in Dublin.
36. A draft boundary for the Irish Sea for the purposes of the Pilot was developed on the basis of biogeographical factors. An initial email consultation exercise was carried out with stakeholders which provided briefing on the Pilot and sought comments on the proposed boundary. As a result of stakeholder comments, the southern boundary was amended. The revised boundary is shown on the maps accompanying this Report. This initial consultation was followed by specific consultations over the availability of data, and on the interim reports on data collation, marine landscapes, nationally-important features, nationally-important areas, conservation objectives, legislation, governance and enforcement.
37. A range of bilateral and multilateral meetings with key stakeholders were held. The level of engagement of non-UK bodies was, however, somewhat variable. A close working relationship was quickly established with the Isle of Man Government, and the Government of Ireland also gave policy support to the Pilot at an early date, but practical collaboration with Ireland would undoubtedly have been enhanced if discussions had been initiated prior to the commencement of the Pilot. The European Commission received communications about the Pilot, but during the conduct of the Pilot, the level of Commission engagement was less than had been hoped, as this could have been a conduit for liaison with other Member States. A presentation was given at a meeting of the OSPAR Biodiversity Committee and presentations on the marine landscapes work were given to a small number of other European meetings.
38. Liaison was maintained with a range of concurrent Governmental initiatives, including the Defra UK Integrated Coastal Zone Management Stocktake, the Review of Byelaw Powers for the Coast, the Review of Development in Coastal and Marine Waters, the work on Strategic Environment Assessment for renewable energy development, and the Sustainable Scottish Marine

Environment Initiative. Close liaison was also maintained with the Review of Marine Nature Conservation's subgroups on Legislation and Information.

39. In retrospect, the origin of the Pilot as a UK initiative, without the equal engagement of the Governments of the Isle of Man and Ireland at the outset, constrained the Pilot's ability to take a full Regional Sea perspective. Greater attention in the early planning stages will be required to ensure that a future Regional Sea scale project meets the marine policy and management objectives of stakeholders from all the countries involved.

Recommendations

40. The Communications Strategy proved cost-effective for the purposes of the Pilot, and the general approach adopted is considered to have been appropriate. The principal recommendation arising for the work was:

R1 The Government should promote the 'Regional Seas' approach and the framework for marine nature conservation with the European Commission, OSPAR and countries bordering on the north-east Atlantic.

41. Further, a number of good practice measures would need to be put in place if the framework for marine nature conservation were to be applied to other Regional Seas. These are:
- i. when implementing the framework at the Regional Sea scale, sufficient preparatory time (at least 6 months and preferably a year) should be allowed for discussions to take place with other Governments having jurisdiction within that sea area, prior to the commencement of the work, to enable the necessary level of engagement and support to be developed;
 - ii. sufficient preparatory time should also be allowed for the development of an up-to-date and comprehensive stakeholder database. This work could be undertaken in parallel to discussions with other Governments;
 - iii. engagement of stakeholders is best carried out by the Government of the country concerned, both to avoid the impression that the initiative is being imposed from outside, and also because communication with such stakeholders is most effectively undertaken in their own language. This would require close co-operation between the UK and the other country(ies) involved;
 - iv. while email and web based communication proved satisfactory for the Pilot, this might not be the case when implementing the framework with other Regional Seas, and a preliminary consultation with stakeholders on the best means of communication should always be undertaken;
 - v. while local stakeholders were accorded a lower priority in the Pilot, work to implement the framework with other Regional Seas will need to give full and careful consideration to the need to involve local stakeholders and also the best method of engaging all the stakeholders in the work.
42. A full report on the Irish Sea Pilot Communications Strategy is available (Vincent *et al.*, 2004 and online at www.jncc.gov.uk/irishseapilot).

4. DATA COLLATION AND MAPPING

43. The purpose of the data collation and mapping tasks undertaken by the Pilot was to provide the other tasks with the necessary level of information to enable their satisfactory completion. At the outset, three basic assumptions had been made about the availability and handling of data. These were that:
- i. the Irish Sea had been well studied in the past so there would be a relatively high level of relevant information available, although for some sectors (e.g. recreation and tourism), difficulties in obtaining collated information could be expected;
 - ii. much of the information would be held by organisations participating in the Pilot, or would be in the public domain through published papers and reports; and,
 - iii. the best way to hold and manipulate the information would be via a desktop GIS which would facilitate mapping and enable the analysis of data by relating datasets spatially to one another.
44. The most important uses of Irish Sea data were expected to be:
- i. to enable the identification and biological characterisation of marine landscapes;
 - ii. to apply the draft UK criteria for the identification of nationally-important habitats and species;
 - iii. to identify areas in the Irish Sea with high biodiversity or which are otherwise particularly important for nature conservation;
 - iv. to explore relationships between the distribution of important nature conservation features and the nature and intensity of human use of the Irish Sea;
 - v. to help disseminate the outcomes of the Pilot through map-based products.
45. At the commencement of the Pilot, it was far from clear which elements of the mass of Irish Sea information potentially available would actually be needed for the work. There was no wish to expend resources on the collation of quantities of data that would not be used subsequently. There was, therefore, a need to carry out a prioritisation exercise early on in the data collation process, and to concentrate effort on acquiring and mapping the priority datasets identified through that process.

Method

46. Preliminary work was undertaken to identify the occurrence, ownership, availability and format of relevant datasets, and to identify priority datasets from those potentially available. Factors which guided the acquisition of physical, hydrographical and biological data were:
- i. the probable utility of the data for the purposes outlined in paragraph 44 above;
 - ii. the geographical coverage of the data within the Irish Sea, since data covering wide areas are more useful for analytical purposes than data relating to limited areas;
 - iii. the format, cost and ownership of the data, and the degree of difficulty of conversion required;
 - iv. whether similar data were likely to be available for other Regional Seas, since the Pilot needed to develop methods that could be used in other sea areas.

47. Similar factors were used to prioritise data on natural resources and human uses of the Irish Sea together with two other factors, namely:
 - i. the probable importance of a particular human activity in relation to conservation interests;
 - ii. whether the data would help in identifying how people use the Irish Sea and hence help to define the importance of sectoral interests, or which could be used to underpin spatial planning or other means of regulating human activity strategically.
48. Following the completion of the work to identify data priorities, discussions were held with organisations which owned the most important datasets with a view to the Pilot acquiring the data or access to the data. Some datasets had to be purchased, some licensed, others compiled under contract.
49. A dedicated high specification GIS workstation was purchased to meet the Pilot's data management, analysis and presentation requirements. Although other widely-used proprietary GIS software would probably also have met the needs of the Pilot, ArcView8 software from Environmental Systems Research Institute was selected because it was considered to meet the Pilot's technical needs and because technical support for this system was already available within JNCC.

Results

50. A base map for the coastline, and the 3, 6 and 12 mile limits for the UK, Ireland and the Isle of Man, was a necessity for the Pilot. Coastline data has to be sufficiently detailed to allow display at a wide range of scales; 1:10,000 or less is required for local spatial planning decisions, while 1:2,500,000 or greater may be appropriate for matters which relate to the Irish Sea as a whole. There were problems with the preparation of an adequate coastline dataset. Detailed coastline data were not available for Ireland or the Isle of Man. For the UK, the Ordnance Survey uses mean high water for its coastline, but this differs from the UK Hydrographic Office and British Geological Survey (BGS) high water coastlines, creating a mismatch between datasets. To resolve this, a pragmatic approach was adopted in which a new dataset was compiled using a variety of sources at the best scale available. This involved merging datasets from the Ordnance Survey and the Marine Institute of Ireland.
51. Hydrographical data (including data on water temperature, salinity, currents and frontal systems) were provided at no cost by the Proudman Oceanographic Laboratory, the British Oceanographic Data Centre and the Plymouth Marine Laboratory. Examples of such hydrographical data are the data for sea floor temperature in winter shown in Map 1. These hydrographical data were used in the definition of certain seabed marine landscapes and also in the definition of water column types. The data used were modelled data and required considerable manipulation.
52. Bathymetry (Dig Bath) and seabed (Dig SB250) data were obtained under licence from the BGS in the format of ArcView8 compatible files. Examples of these data are those for the bathymetry of the Irish Sea shown in Map 2. These data, combined with bed form and slope data, were of great utility in the definition and mapping of marine landscapes.
53. Data on vertebrates were obtained from a number of sources, including CEFAS (commercial fish), JNCC (seabirds), JNCC, Sea Mammal Research Unit and SeaWatch Foundation (cetaceans), and the Marine Conservation Society (basking sharks). Data on seals were obtained from a number of sources. These data varied in quantity and distribution, frequently becoming scarce away from the coast.

54. Data on benthic communities were collated from a wide range of sources. The Marine Nature Conservation Review database held by JNCC formed the principal component of the inshore data, with additional information being provided through MarLIN (the marine component of the National Biodiversity Network), the Countryside Council for Wales, universities and research institutions. The Irish BioMar data were made available. Map 3 shows the distribution of benthic community data records available from these sources. As can be seen from Map 3, while high density data are available for coastal and inshore locations, the data for offshore areas were much more sparse. The reasons for this are that most data have been obtained by organisations having primarily coastal interests, that offshore data are more expensive to obtain than inshore data, that there has been insufficient co-ordination to ensure that surveys have been carried out systematically across the Irish Sea, and that some data holders did not make their data available to the Pilot. These issues are considered in more detail later in this Chapter.
55. Data on the distribution and relative intensity of fishing effort were obtained from Defra and the Scottish Fisheries Protection Agency. These data were derived from aerial surveillance, and CEFAS assisted in their analysis. CEFAS also mapped the fishing grounds to complement the surveillance data and achieve a more comprehensive view of fishing activities; the results of this analysis are shown in Map 4. Information on sites licensed for mariculture purposes was obtained from a range of Governmental sources.
56. Spatial data on ports, shipping routes and shipping intensities for the Irish Sea were purchased from Anatec UK Ltd in GIS format. Examples of these data are the data for the main Irish Sea shipping routes shown in Map 5.
57. Spatial data on the oil and gas industry were obtained in GIS format from the UK Digital Energy & Atlas Library (UK DEAL) website. These included maps of the oil and gas fields, the location of wells, pipelines and surface structures. UK DEAL is regularly updated and linked to the Department of Trade and Industry oil and gas website. The data are freely available and UK DEAL is a good example of a one-stop shop for sectoral GIS data.
58. Data on renewable energy development, including on current proposals, were obtained from the Crown Estate, Department of Trade and Industry, Department of Communications, Marine and Natural Resources (Ireland) and from work carried out by the Irish Sea Study Group.
59. Data on sand and gravel extraction, including areas licensed in the UK sector of the Irish Sea, and on actual dredged areas, were provided by the Crown Estate and the British Marine Aggregate Producers' Association.
60. Data on coastal land use, including on the location and population size of coastal settlements, major existing and proposed coastal developments with direct linkage to the Irish Sea, and Food and Environment Protection Act consents were obtained from a variety of sources. Settlement locations and sizes and population data were obtained through a contract with BMT Cordah. Food and Environment Protection Act data were obtained from Defra. An example of these coastal land use data are the data for coastal settlements shown in Map 6.
61. Information on submarine cables was obtained on licence from Global Marine Services in GIS format.
62. Information on coast defence and flood defence structures in England was obtained from the Defra/Environment Agency Flood and Coast Defence Asset database, in GIS format. Data for Scotland were provided in the form of paper maps. It did not prove possible to obtain similar data for Wales or Ireland.
63. As expected, data on the range of tourism and recreation activities were found to be limited and patchy. Some data on water sports such as sailing and on marinas were acquired from the Royal

- Yachting Association and from the Irish Sailing Association. Data on the location of EU Bathing Waters and of Blue Flag beaches were provided by the UK and Irish environment agencies.
64. Data on the locations of waste water and industrial discharges, together with information on the levels of treatment and riverine inputs of nutrients, were obtained from the UK and Irish environment agencies.
 65. The distribution and classification of military practice and exercise areas (PEXA) were purchased as an ArcGIS dataset from Metoc who maintain the data with the UK Hydrographic Office. The dataset includes military vessel exercise areas and firing and bombing ranges. Fisheries Research Services provided data on the Beaufort's Dyke munitions dump.
 66. The locations of spoil disposal sites were provided by Defra/CEFAS for the UK, and by the Department of Communications, Marine and Natural Resources for Ireland. Food and Environment Protection Act consent locations for capital and maintenance dredging operations were also obtained.
 67. Information on the locations of statutorily-protected nature conservation sites was obtained from the nature conservation agencies; information on the locations of wrecks and Scheduled Ancient Monuments from the statutory heritage agencies, and on areas closed for fishing from fisheries departments and Sea Fisheries Committees.
 68. About a third of all the data were obtained in GIS format requiring a minimum of manipulation. A further third were provided in Excel or Access databases requiring conversion, interpolation or reclassifying, and the remainder were supplied in paper form and were digitised for GIS.
 69. Investigating data availability, ownership and format, acquiring the priority datasets from the data owners, and converting the non-GIS data to GIS form, all proved time-consuming. Furthermore, the resultant data are incomplete in their coverage of the Irish Sea.
 70. ArcView8 proved suitable for most of the Pilot's data analysis and mapping requirements, although some data conversion required the 'Spatial Analyst' extension. The final datasets (shape files) can be viewed using the free ArcExplorer package. ArcGIS was found to integrate well with Microsoft Access databases, and, through Access, with Microsoft Excel spreadsheets. Transfer of files between GIS software, specifically from Map Info, to ArcGIS was found to be straightforward.

Discussion

71. **Better co-ordination:** While the concentration of data collection effort by organisations in order to meet their specific operational needs is quite understandable, the relative absence of strategic or co-ordinated data collection for the Irish Sea (as evidenced by the benthic community data) is a major constraint on effective environmental management and spatial planning. Furthermore, because offshore survey is relatively expensive, a greater degree of collaboration between organisations in data collection, for example in the use of vessels and equipment, would help to reduce survey costs.
72. **Data availability:** There is great variation in the availability of information in relation to natural resources and human activities. Much information is available from Government Departments and agencies, for example oil and gas related data held by the Department of Trade and Industry. In contrast, for shipping and navigation data this did not appear to be the case, and recourse had to be made to the private sector for this information. For tourism and recreational activities, a key sector for the Irish Sea economy and employment, and a sector which can be expected to grow further in the future, the collection and collation of data appeared insufficiently co-ordinated.

73. Significant environmental data which had been collected with public funds were not made available to the Pilot for various reasons. These included the fact that the data were not held in a suitable format, and also the wish to avoid placing the data in the public domain. Other data had to be purchased or licensed from publicly-funded bodies, (using the Pilot's public funds). The argument that it is in the public interest for environmental data collected with public funds to be placed in the public domain, and not withheld or charged for, appears very strong.
74. Some data collected for the purposes of environmental assessment and held by the private sector were withheld from the Pilot because they were considered to be commercial-in-confidence. Potentially, this practice leads to unnecessary duplication of survey and for decisions to be made taking only a proportion of collected data into account. This would appear to run counter to the public interest.
75. In contrast, initiatives such as UK DEAL and the National Biodiversity Network are examples of current good practice in placing environmental, human activity, and regulatory decision data in the public domain where it can be used to support a wide range of activity and also to help regulate that activity in the public interest.
76. **Metadata:** Metadata (which show when, where, why, how and by whom the data were collected and to what standards) were generally not readily available for most biological and human activity data obtained by the Pilot. This has the effect of limiting the value of the data quite significantly.
77. The Pilot confirmed the findings of the Marine Environmental Data Group of the Inter-agency Committee on Marine Science and Technology (IACMST), who are undertaking a data strategy study as summarised in their draft report *Marine Data and Information - Where to now?* We look forward to the final stages of the study refining and clarifying their proposed UK strategy. The study followed a request from Defra to IACMST to look at the scope for better integration of mapping information about the marine environment.

Recommendations

78. The following recommendations are made with respect to coastal and marine data matters.

R2 A standard electronic marine and coastal map/chart base should be established, extending seamlessly across the coastline, which can be used at a range of scales from the Regional Sea (1:1,000,000 or less) to local level (1:10,000 or greater). Consideration should be given to a strategic funding mechanism to enable the necessary harmonisation.

R3 A national marine information network should be established, based on harmonisation rather than integration. There is likely to be a key role for a number of institutions and bodies having the capability of managing data in the long-term, and providing public access to it, each managing and providing access to specific datasets to common standards. Data standards should be developed, where possible jointly with the other countries bordering Regional Seas and with the European Union, in order to facilitate the establishment and operation of this system. A mechanism to co-ordinate this will need to be established.

R4 All marine data collected with public funds, or as a consequence of Government or Public agency contracts, should be held electronically to agreed formats and standards and placed in the public domain within specified timescales. These data should be contributed to a national marine information system once established. Public funds made available to universities, research institutes or other organisations should be subject to these conditions.

- R5 Environmental data collected by the private sector for the purpose of complying with a regulatory procedure (e.g. for Environmental Impact Assessment) should be collected to agreed formats and placed in the public domain within specified timescales.**
- R6 Improved co-ordination of data collection activities needs to be achieved, including in relation to research activities, in order better to meet the needs of society and to make the most efficient use of available resources. This should include much clearer identification of the specific data collection responsibilities of public bodies. In the UK, Defra should take the lead in developing improved co-ordination, including in relation to liaising with neighbouring countries. A greater degree of collaboration between survey organisations should be promoted and encouraged.**
- R7 Information on the sources, availability, extent and attributes of datasets (comprehensive metadata) for the marine environment needs to be easily and widely accessible.**
79. A full report on Data Collation and Mapping, including details of the datasets acquired in the Pilot, is available (Lumb *et al.*, 2004a, and online at www.jncc.gov.uk/irishseapilot).

5. THE WIDER SEA

Key features and interests

80. The area of the north-east Atlantic within national jurisdictions and between the Bay of Biscay and the Faroes, extends to some 2.2 million sq km (866,000 sq miles).
81. Of this area, the seas falling within the jurisdiction of the United Kingdom extend over 867,000 sq km (335,000 sq miles) - an area three and a half times its land area. These seas vary in depth from the shallow waters of the southern North Sea, down to over 3,000m in an area 200 miles west of Rockall. They range in climate from the warm temperate waters of the south-west approaches, to bottom sub-arctic waters between the Faroes and Norway where the water temperature rarely exceeds 0°C.
82. The biodiversity of the seas varies from populations of species which have relatively low mobility to those which are highly mobile. An example of a highly mobile species found in the Irish Sea is the Manx shearwater which breeds on the islands off the coasts of Pembrokeshire, Co. Down and Co. Waterford and overwinters off the coasts of northern Argentina and southern Brazil. Map 7 shows the summer distribution of Manx shearwater in British and Irish waters. Many species of fish, seabirds and cetaceans are migratory or highly mobile, with individuals seasonally or periodically traversing hundreds of kilometres.
83. The distribution of many marine species is determined by a range of geophysical and hydrographical parameters as well as biological interactions. At the scale of the north-east Atlantic, the main factors which influence the character of marine ecosystems are temperature, depth and currents. Superimposed on these are other important factors such as topography, substratum type, salinity and exposure. JNCC, as part of its contribution to the work of the Review of Marine Nature Conservation, has identified a number of biogeographically determined 'Regional Seas' using, primarily, the factors of temperature, depth and currents. These Regional Seas have been identified for UK waters, but overlap the waters of neighbouring countries; they are shown in Map 8.
84. The seas are also key to the economy and quality of life of countries bordering the Regional Seas, through their contribution to tourism and recreation, primary energy supplies, defence, ship-borne trade and passenger transport, fishing, mariculture and marine aggregates. The total contribution to the UK economy of marine-related economic sectors was calculated by Pugh and Skinner (2002) to be £69 billion (€99 billion). The largest of these marine sectors is the oil and gas industry with annual revenues of some £23 billion (€33 billion), with 'seaside' tourism contributing an estimated £17 billion (€24 billion), the Royal Navy £6.7 billion (€9.6 billion) and ports and shipping some £1.7 billion (€2.4 billion). Other important contributors to the economy are sea fisheries, £0.55 billion (€0.78 billion), mariculture, £0.35 billion (€0.5 billion), and marine aggregates, £0.13 billion (€0.19 billion). However, this economic and social activity can have a significant impact on marine biodiversity and the general health of marine ecosystems, as can land-based and airborne pollution (OSPAR Commission, 2000; Frid *et al.*, 2003). In consequence, there is a need to ensure it is regulated appropriately and effectively.

Legislative controls

85. **UNCLOS:** The regulation of human activity in the UK's seas and adjacent waters is heavily influenced by international law. The UN Convention on the Law of the Sea (UNCLOS) provides a comprehensive framework for the regulation of all uses of the oceans. The Convention entered into force in 1994, with the UK acceding in 1997. It provides for the innocent passage by ships of all States through the territorial sea of a State. However, passage is only innocent so long as it is not prejudicial to the peace, good order or security of the coastal State. If a State engages in fishing activities in the territorial sea of another State, passage is considered prejudicial to the

- interests of the coastal State and is no longer innocent passage. UNCLOS also provides that any act of wilful and serious pollution contrary to the Convention is also not compatible with the exercise of innocent passage.
86. **Shipping:** The regulation of international shipping, particularly with respect to safety, through the development of international standards, is the responsibility of the UN International Maritime Organisation (IMO), while the issue of pollution from ships is covered by the International Convention for the Prevention of Pollution from ships (MARPOL). Effect is given to the standards and requirements of these international fora through a range of mechanisms, including EC legislation and national law.
 87. **Fisheries:** The management of fisheries within all waters of EU Member States is governed by the EU Common Fisheries Policy (CFP). The CFP is underpinned by the principle of non-discrimination between Member States, with the basic precept of 'equal access'. However, waters out to 6 nautical miles from baseline may only be fished by vessels registered in the territorial state. Between 6 and 12n miles other Member States with historic rights also have access, although the recent CFP reforms now provide for more executive control for the territorial state within this zone. Beyond 12n miles, access to vessels from other Member States is limited, based on historic rights, and with non-member countries by reciprocal agreements with the EU. The CFP seeks to manage stocks of fish in EU waters principally by implementing catch quota management measures, by setting agreed annual Total Allowable Catches for particular stocks of commercial fish and by means of various technical conservation measures, including minimum landing sizes, fishing gear restrictions and closed areas. In offshore waters, the CFP is regulated through EC Regulations; inshore, it is regulated primarily through national legislation.
 88. **Development and water quality:** Major developments in UK waters will be subject to EC legislation on environmental assessment and strategic environmental assessment. Water quality issues are covered by the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR), and a range of water quality standards are set down in a number of EC Directives. Nature conservation below low water mark and in inshore waters is partly covered by UK domestic legislation, and partly by legislation implementing the EC Habitats and Birds Directives, which also apply to offshore areas within the jurisdiction of Member States (although the UK has not yet transposed the Directives into national legislation for offshore waters).
 89. It will be seen from the above, that the regulation of shipping, fishing, major developments, water quality and nature conservation in north-east Atlantic waters is determined or influenced by international Conventions and institutions, and by European Union legislation. Modification of such over-arching regulation, therefore, is at the 'Wider Sea' scale through agreement achieved within the UN fora, OSPAR and the European Union.
 90. **Ecosystem Approach:** A concept gaining increasing international momentum is the Ecosystem Approach of which one of the better definitions is that set out in the Report by the US Interagency Ecosystem Management Task Force (1995), which described the Ecosystem Approach as: 'a method for sustaining or restoring natural systems and their functions and values. It is goal driven, and based on a collaboratively-developed vision of devised future condition that integrates ecological, economic and social factors. It is applied within a geographic framework defined primarily by ecological boundaries.'
 91. The Ecosystem Approach is now seen as an underpinning philosophy of the Convention on Biological Diversity. It was included in the Declaration of Intent at the World Summit on Sustainable Development (United Nations, 2002), and is included in the developing EU marine thematic strategy, and in the UK's developing marine strategy (Defra, 2002a). The Convention on Biological Diversity has adopted 12 Principles for applying the Ecosystem Approach in practice (Convention on Biological Diversity, 2000).

Discussion

92. A key Principle of the Ecosystem Approach is the avoidance of financial incentives and subsidies which have an adverse impact on ecosystems. Financial incentives and subsidies are normally applied either to stimulate the development of a particular human activity in an innovative way and/or to support an existing human activity where it might otherwise decline. In both cases, the purpose of the financial support given is to stimulate the economy and support local communities. An example of an adverse incentive has been the use of EC funds to increase the efficiency of the European Union's fishing industry. The result has been the over-exploitation of many fish stocks to a degree which is highly deleterious both to sustainable fishing and to the environment. Application of the Ecosystem Approach would mean the re-direction of these incentives to promote the restoration of fish stocks to optimal levels of yield, while stimulating the development of additional, sustainable, uses of the marine environment.
93. In connection with shipping, there are two current aspects of environmental concern at the 'Wider Sea' scale. The first relates to the need to avoid shipping accidents and the polluting consequences of such accidents. Currently, safety standards employed in the international shipping of oil, chemicals and waste still fall below good current practice in matters of ship design, construction and maintenance, navigational advice to mariners and the resolution of language difficulties. The designation of Marine Environment High Risk Areas in the UK, and of Particularly Sensitive Sea Areas internationally, has been slow. The second aspect relates to the need to avoid the introduction of non-native marine species through the inappropriate discharge of ballast water, or as a result of their attachment to ships' hulls. IMO is currently in the process of finalising the Convention on the management of ballast water by ships to minimise the introduction of harmful or unwanted aquatic species. However, again, progress in implementing good practice has been slow. Dealing with the issue of organisms attaching to ships' hulls remains problematic.
94. Finally, an issue which needs to be addressed at the Wider Sea scale is that of monitoring the state, and changes in state, of the marine environment, and the relative impact of human activities. Defra is currently engaged in a process of co-ordinating and rationalising monitoring in UK waters to improve its effectiveness and efficiency (the UK Marine Monitoring Strategy). Such monitoring programmes need to address the requirement to assess the state of our seas. It could be expected that benefits would also accrue from greater international co-operation in relation to monitoring, including in the development of standards and the promotion of data sharing.

Recommendations

95. The following recommendations are made with respect to the 'Wider Sea':
- R8 To achieve successful application of the ecosystem approach, international and national policy and legislation should support, and not frustrate, the achievement of strategic goals for the marine environment. Incentives and subsidies which encourage or support unsustainable impacts on ecosystems should be avoided. For example, and in particular, efforts should continue to mitigate the adverse effects of EU fishing incentives and replace them by incentives which promote the restoration of fish stocks, support responsible fishing practice, and encourage the diversification into other, sustainable, uses of the marine environment.**
- R9 Action to co-ordinate and rationalise marine environmental monitoring, and the monitoring of human impacts on the environment, should be completed and extended. Monitoring programmes need to address the requirement to assess the state of our seas. Co-ordination of monitoring with adjacent countries through *inter alia* the development of agreed standards and of data sharing should also be pursued.**
96. Further recommendations relevant to the 'Wider Sea' are contained in Chapter 13 on Legislation, in Chapter 14 on Enforcement and in Chapter 15 on Governance.

6. THE REGIONAL SEA

Defining boundaries

97. As explained in paragraph 83, it is practical to subdivide the UK and adjacent sea areas into a number of Regional Seas on the basis of biogeography using factors such as water temperature, depth and currents. The work undertaken on this to date has focused on the area of sea covered by UK jurisdiction, but such Regional Seas, being based on ecological characteristics, will cross national boundaries in some areas. Further work needs to be undertaken, in collaboration with other country partners, to complete the identification of Regional Sea boundaries in such cases.
98. The draft framework for marine nature conservation considered that such Regional Seas could *inter alia* form the basis for environmental management action, including spatial planning. The degree to which Regional Seas can be used in this way can be expected to vary. Clearly-defined Regional Seas, such as the Irish Sea, will lend themselves to this approach. In contrast, the Regional Seas identified in Map 8 west of the Hebrides are less amenable to this approach, and, in practice, it may be considered desirable, in some cases, to combine Regional Seas for environmental management purposes. This would be a matter for practical decision by the countries with a jurisdictional interest in the Regional Seas concerned.
99. The Irish Sea was selected as an appropriate Regional Sea for the purposes of the Pilot, partly because it had been relatively well studied in the past. Descriptions of the biology, human impact and management of the Irish Sea were published by the Irish Sea Study Group in 1990, and more recent accounts are contained in Boelens *et al.* (1999), Weighell *et al.* (2000) and in the OSPAR Quality Status Report, Region III (OSPAR Commission, 2000), among a wide range of other publications.

Physical description of the Irish Sea

100. The Irish Sea is one of the smaller Regional Seas, about 58,000 sq km (23,000 sq miles) in area. In character, it has the form of a fairly shallow basin, with depths ranging from 20-100m over considerable areas, but with a deeper channel, exceeding 100m, extending north-south in the western part of the Irish Sea which reaches a maximum depth of 315m in Beauforts Dyke. This deeper channel connects with the Celtic Sea via St George's Channel in the south, and with the Malin Shelf through the North Channel. Water moves into the Irish Sea from the Atlantic Ocean through the St George's and North Channels; the two branches meeting to form a standing wave and weak currents to the south-west of the Isle of Man. Gravelly sediments occur extensively in a broad central belt, often in areas subject to tidal currents. Areas of sandy substrate, often moderately mobile, occur fairly extensively, and sand waves and megaripples occur north of the Isle of Man, in Liverpool Bay, Cardigan Bay and also in St George's Channel. Muddy sediments are present in two large areas in the northern half of the Irish Sea in low energy environments. There are also large areas of exposed till in St George's Channel, and areas of exposed bedrock occur locally in the North Channel and between Anglesey and the Isle of Man (Boelens *et al.*, 1999).
101. Although it differs in detail, the Irish Sea, in terms of depth and substrate type, has much in common with adjacent seas overlying the continental shelf, such as the eastern Celtic Sea, the English Channel and the North Sea. However, the seas to the south and west of Ireland, and west of the Hebrides, are significantly deeper, while those to the north of Scotland are both deeper and colder.

Economy and human population summary of the Irish Sea

102. The total human population residing in coastal localities within 10km of the Irish Sea coastline is estimated to be in the order of 6 million. Marine-related human activities dependent on the Irish Sea contribute to the regional and national economies in a similar manner to that described for the

Wider Sea in paragraph 84. Generally speaking, economic and employment statistics are not compiled in a manner which enables their ready collation at the Irish Sea level. However, a reasonable estimate of the annual economic contribution of the principal marine sectors would be in the order of £6 billion (€9 billion) for the Irish Sea as a whole.

- 103 The Pilot commissioned Posford Haskoning Ltd to collate statistics on the contribution to the regional economy of the principal sectors which are directly dependent on the Irish Sea. This was not a straightforward piece of work as statistics are compiled for different reasons and are rarely available on an Irish Sea basis. Consequently, amalgamation and estimation had to take place. The contractors were able to utilise the methodology and some of the information provided in the major study undertaken by Pugh and Skinner (2002). The results of the work undertaken by Posford Haskoning Ltd (Lindsay and Stocks, 2003) are summarised below.

Tourism and recreation (seaside tourism and sea based recreation)

104. Statistics on tourism and recreation were not available in a form which enabled collation at the Irish Sea scale. Nonetheless, the tourism and leisure sector probably contributes the most of all the marine sectors to the regional economy. Statistics which are available indicate a contribution to the regional economy in the order of £2.5 billion (€3.6 billion) per annum, with between 100,000-200,000 people directly employed in the sector.
105. The value of seaside tourism to Wales in 2001 is estimated at £0.9 billion (€1.3 billion), and resorts along the eastern coasts of the Irish Sea are important for the sector; for example Blackpool attracts 17 million visits a year with an annual expenditure of £545 million. Some 0.54 million tourist trips are made from Northern Ireland to Scotland each year, spending an estimated £114 million and supporting an estimated 3,800 jobs.
106. In Ireland, interest in coastal and marine based activities is growing. In the mid 1990s, over 260,000 overseas visitors participated in water-based activities, representing 29% of the total outdoor market. In 1989, an estimated 15,000 people participated in sailing in Dublin Bay alone. Leisure craft services are growing with an expansion of marine developments around the whole of the Irish Sea. At the last Dublin Boat Show some £30 million was spent.
107. Recreational angling is an increasingly important part of the rural economy. In England and Wales, CEFAS have calculated the commercial catch of bass in 1993 at first sale to be c. £5 million, whereas, during the same period, the recreational fishery generated almost £19 million of expenditure. In Ireland, national legislation has banned most commercial netting of bass and this has resulted in local and long-distance sea angling tourism valued at £17 million per annum.
108. An important factor in maintaining 'seaside' tourism and sea-based recreation is ensuring that the water quality of the sea, particularly in the vicinity of resort beaches and other important recreational areas, is maintained at a high level. Map 9 shows the distribution of EU bathing waters and 'blue flag' beaches around the Irish Sea. Maintaining the supply of sand to holiday beaches is also an important consideration.
109. In its character, the nature of tourism and recreation around the Irish Sea is changing. Numbers of visitors to traditional seaside resorts have declined; with much of this high-volume/low-cost tourism moving abroad. In its place, there has been a growth in the number of people wishing to enjoy a more active holiday experience and being prepared to pay the higher cost involved. Such tourism includes yachting, motor cruising, sailboarding and other watersports, sea angling and diving. Servicing this growing sector represents an opportunity for reinvestment in the tourism and water recreation sector, and a potential transfer of economic activity, both from within the tourism sector and also from other sectors, such as fishing, into this area. Such recreational activities may have local impacts on coastal habitats and wildlife, directly, or through coastal developments, such as marinas.

Oil & gas

110. Oil and gas is among the most important of the Irish Sea marine-related economic activities with a total revenue in 2001 of £1.56 billion (€2.2 billion). Oil and gas production from the Irish Sea is currently all in UK waters, and derived from the north-east Irish Sea. The production is mainly of gas (equivalent to 13.6% of UK gas production, whereas Irish Sea oil contributed 2.77% of UK oil production, in 2001). Map 10 shows the location of the main current oil and gas production sites in the Irish Sea.
111. The number of people directly employed in activities relating to oil and gas production in the Irish Sea is in the order of 700-1000. These include about 350 people employed offshore, and some 450 people employed at the Heysham support base and the Barrow and Point of Ayr gas terminals.
112. Oil and gas production in the Irish Sea is not dependent on the marine environment *per se*, but on the occurrence of these resources from strata overlain by the sea. The resources are exploited as economically and safely as possible, with considerable care taken to avoid harm to those engaged in this and other marine sectors, or to the environment. Exploration and production activities may have local impacts on the seabed and water column. Cetacean densities are low in the Irish Sea and seismic survey work is undertaken to strict guidelines to minimise impact.

Ports & shipping (imports/exports, ferries)

113. About 100Mt of imports and exports passed through Irish Sea ports in 2002. Milford Haven and Liverpool accounted for 34.5Mt and 30.4Mt respectively, Belfast 16Mt (in 1996), Dublin 9Mt (in 1995) and the Manchester Ship Canal ca 8Mt. Port activities at Clydeport yielded a turnover of £41.4 million in 2001.
114. 80% by volume of Ireland's exports and imports pass through its ports and trade is continuing to rise. The UK remains Ireland's most important trading partner, accounting for just over 31% of imports and 21% of exports.
115. Passenger travel across the Irish Sea is also very important, with numbers of sea passengers using the main routes calculated at 6.665 million in 2002. The main ferry routes are shown in Map 11. Figures using the main routes are reported in the Transport Statistics Bulletin, National Statistics Office 2003, and shown below.

Route of travel	Number of passengers (000s)
Fishguard-Rosslare	662
Holyhead-Dublin	1,354
Holyhead-Dun Laoghaire	1,017
Liverpool-Dublin	291
Liverpool-Belfast	137
Liverpool-Douglas	286
Pembroke-Rosslare	287
Stranraer-Belfast	1,296
Cairnryan-Larne	651
Troon-Belfast	332
Heysham-Douglas	252
Total	6,665

116. The ports and shipping sector is a significant employer in the Irish Sea region, with in the order of 10,000-15,000 people directly employed in the sector.

117. The sector utilises the ability of the sea to transport materials and people at relatively low cost. Shipping requires water of sufficient depth and, in shallow areas, this leads to dredging and sediment disposal operations. The economy of sector operations, and human and ship safety, are key considerations. Port development can have significant impacts on coastal habitats and processes, and navigational dredging can have local marine impacts. The possible introduction of non-native species in ballast water or on ships' hulls is a potential problem, and accidental spillages and illegal discharges of oil may have significant, though generally transient, impacts.

Naval defence

118. HM Naval Base Clyde at Faslane is the headquarters of the Royal Navy in Scotland and home to the UK's strategic nuclear deterrent. The management of all submarine and surface ship maintenance, together with the provision of ancillary services, takes place in the area. The Base provides personnel support for 3,000 service personnel, 800 service families and 4,000 civil servants. In total, naval defence around the Irish Sea directly contributes perhaps £1 billion per annum to the regional economy and employs 10-20,000 people. The BAE Systems Marine shipyard at Barrow is engaged in the £3-4 billion contract to construct Astute Class submarines, and its shipyard on the Clyde will be involved in the £5.3 billion contract to construct the Type 45 Destroyer. These contracts are expected to sustain around 10,000 jobs in the shipyards, subcontractors and supply chain. BAE Systems has also been awarded, jointly with the French company Thales, a £2.9 billion contract to build 2 aircraft carriers. The Gorvan and Scotstoun Yards in Glasgow will manufacture sections for assembly at Rosyth Dock yard. This contract is expected to create around 2,000 jobs and safeguard a further 10,000 at UK shipyards. In Ireland, there is a naval base at Haulbowline in County Cork.
119. The construction of naval vessels and the operation of shore bases can have similar impacts to other coastal developments on coastal habitats and processes. Naval operations generating high intensity underwater sounds may impact upon cetacean and other marine species.

Renewable energy

120. The production of electricity from renewable sources based on the Irish Sea is expected to develop substantially over the next 15 years. Five offshore wind farm projects in the Irish Sea have already acquired consent under the UK government's Round 1 licensing. When the Round 1 projects are complete, they will have a combined capacity of about 600MW. In addition, there are six proposed sites on the east coast of Ireland. The 25MW Arklow Bank site is due to begin generating by the end of 2003.
121. It has been estimated that windfarms will occupy an area of 135km² by 2010 and 254km² by 2020 in the eastern Irish Sea, although maximum credible estimates could be double this. The planned development of Liverpool Bay might create between 1,500 and 6,000 jobs during the construction phase, though longer-term employment for the sector is likely to be of a lower order.
122. Although the region has considerable potential for tidal and wave energy generation, none has yet been realised.
123. The dependency of the industry on the marine environment is mainly limited to wind availability (and potentially tides and waves), and benefits from the modest extent (relative to the situation on land) of competing activity uses. Important considerations are the need to operate the windfarms economically, and to ensure operations are conducted as safely as possible avoiding harm to other sea users and to the environment. Offshore windfarms may impact on seabed habitats and processes, some fish species and aggregations of seabirds.

Sea fisheries

124. Fisheries landings in the Irish Sea had a turnover of around £60 million (€86 million) in 2002, and are summarised below.

	Total weight (tonnes)	Value £ million	Value € million
Shellfish	52,500	43.5	62.2
Demersal	11,900	15.8	22.6
Pelagic	3,900	0.6	0.8
Total	68,300	59.5	85.6

125. These fisheries comprise:

- i. Shellfish: the most important commercial species in the Irish Sea is *Nephrops* worth £8.2 million in 2002. 18% of the total UK catch of *Nephrops* was caught in the Irish Sea VIIa area (excludes the Clyde). Mussels (£3.4 million), Scallops (£3.2 million) and Queens (£2.2 million) are other important species;
- ii. Demersal (bottom or near-bottom living fish): these are generally mixed fisheries targeting primarily cod (£1.8 million), dogfish (£1.5 million), skates and rays, soles, haddock, hake, anglerfish, plaice, pollack and conger eels;
- iii. Pelagic (surface or mid water fish): the 3 principal species are herring (£0.3 million), mackerel and horse mackerel.

126. There has been a decline in the number of vessels (11,108 in 1993 to 7,033 in 2002) and employment (19,044 in 1996 to 12,746 in 2002) in the UK fishing industry in recent years, and it is probable that this trend applies also to the Irish Sea. Direct employment in the Irish Sea fishing industry is estimated at 1,000-2,000. The fish processing and preserving industry also contributes to the economy and employment, but no figures are available for the Irish Sea area.

127. The fishing industry depends on good water conditions, the maintenance of good habitat conditions for spawning and as nursery areas, and the maintenance of plankton productivity and of a complex trophic structure. By its very nature and scale, fishing has an impact on target stocks, on non-target stocks of fish and on other species through their incidental catch in fishing gear. It can also affect marine foodwebs. In the Irish Sea, several fish stocks are close to or below safe biological limits and some skate and ray species are threatened. Certain gears, in particular beam trawls and scallop dredges, have impacts on the seabed due to physical disturbance. Such disturbance is widespread in the northern Irish Sea.

Mariculture

128. Mariculture contributed about £13 million (€18.5 million) to the regional economy in 2001, of which mariculture along the Irish coast contributed £6.9 million (€9.9 million). The main species were mussels (£9.2 million), and Pacific oyster (£3.6 million), with small quantities of native oyster, scallops and Manila clams also being produced.

129. The tonnage and total value of shellfish produced in the UK increased by *c.*50% between 1999 and 2000, due mainly to an increase in mussel cultivation, and the situation is likely to be similar in the Irish Sea. Employment in the industry in the Irish Sea is estimated as being in the low hundreds.

130. Mariculture for shellfish requires clean water conditions and the maintenance of natural productivity.

Marine aggregates

131. The economic contribution of the aggregate production in the Irish Sea is small, with a turnover in 2000 of £1.79 million (1.36% of UK production marine aggregates) Within the UK sector of the Irish Sea, there are 4 areas licensed for dredging, in the north-east Irish Sea. The marine aggregate industry in north-west England employs about 50 people. There is a licence application to extract a further 1.2Mt a year from a further area in the north-east Irish Sea. There has been no significant extraction of marine aggregates in Irish waters in recent years, but the demand for marine aggregates is growing as inland sources are depleted. A marine aggregate strategy is likely to be developed in the near future.
132. Employment in the Irish Sea marine aggregate industry is estimated at less than 100.
133. Aggregate extraction is not dependent on the marine environment *per se*, but on the location of aggregate resources. Avoiding aggregate extraction from shallow water areas helps ensure that sediment support to intertidal habitats and to beaches is not reduced. The removal of seabed material involves disturbance of the benthos and alteration of the seabed profile and may impact upon fish spawning areas. Aggregate extraction is currently very limited in the Irish Sea and the total area being dredged is very small.

Conclusions

134. The primary contributors to the national and regional economy are tourism and recreation, oil and gas, ports and shipping and, locally, naval defence. Of these, tourism and recreation is the most dependent on ecosystem services of clean water and beaches, and the maintenance of natural processes including sediment supply to beaches. For the other sectors, the sea is a medium which supports the sector, but the relationships to the ecosystem are primarily those of ensuring the activity is carried out without substantial adverse impacts.
135. The renewable energy sector is small and increasing. It is unlikely to make a major contribution to the regional economy but may provide significant local opportunities for the port and local construction industries.
136. The fisheries sector makes a relatively modest contribution to the economy and employment. The future of the commercial fisheries depends largely upon the safeguarding and recovery of fish and shellfish stocks and their sustainable exploitation. Recreational angling is likely to make an increasingly important and sustainable contribution.
137. Mariculture and marine aggregates make small but increasing contributions to the regional economy and employment.

Discussion

138. As mentioned in Chapter 5, many issues relating to the regulation of human activity are subject to action at the global, EU or national level, and the issue of whether action at a Regional Sea level is also essential requires consideration. The main benefits of such 'regionalisation' could be expected to be the facilitation and development of bilateral and multilateral initiatives between the UK and neighbouring countries aimed at the better and more integrated management of these sea areas. Such an approach would also enable the involvement of regional and local communities when considering the future use and development of the Regional Sea. While such regional engagement and planning will, necessarily, be undertaken within the context of the broad governance systems referred to in Chapter 5, implementation at the Regional Sea scale could prove effective and beneficial.

139. Examples of potential value of such regionalisation include:
- i. the development of regional strategies for the management of the sea to take full account of the dependency of regional and local populations on the Regional Sea. Such strategies are more likely to be capable of paying due regard to regional and local needs than is strategic planning at the national and international level. An example of such a strategy might be the setting of water quality standards and targets at the Regional Sea level (over and above those set by EU legislation); something that could be expected to benefit from bilateral and multilateral agreements between countries;
 - ii. in some instances, the regulation of human activity might better be achieved at the regional level; for example the establishment of a Regional Advisory Committee on fisheries for the Irish Sea under EC Regulation 2371/2002 could be expected to make a significant contribution to the sustainable management of Irish Sea fisheries;
 - iii. the co-ordination of data collection and survey referred to in Recommendation 6 could benefit from the establishment of a data and research forum at the Regional Sea scale as a means of implementing improved national and EU co-ordination and collaboration;
 - iv. for nature conservation purposes, the Regional Sea approach provides a natural and useful classification of medium-scale marine ecosystems within which Special Areas of Conservation under the EC Habitats Directive, and, potentially, marine protected areas under OSPAR Annex V, can be selected as part of the development of an ecologically-coherent network of such areas (i.e. representative examples of the relevant features would be identified on a Regional Sea basis, and these, combined, will form the national site series).
140. Consideration as to whether action at the Regional Sea level would prove beneficial for sectors other than those referred to above (e.g. for shipping, renewable energy, marine aggregates), may merit further attention.

Recommendations

141. The following recommendations are made with respect to Regional Sea matters:

R10 A system of biogeographical Regional Seas should be developed for the north-east Atlantic by the relevant countries in conjunction with the EU and OSPAR. A good starting point would be the system suggested for UK waters.

R11 The biogeographical Regional Seas referred to in R10 should be considered as a basis for strategic planning and management of national and adjacent waters. It may be desirable to combine some biogeographic regional sea areas into larger areas which are administratively better suited for such strategic planning and management.

R12 Consideration should be given to the establishment of fora at the Regional Sea level to improve co-ordination and collaboration in management planning, data collection, survey and research.

R13 The biogeographic Regional Seas can be used to guide the selection of Special Areas of Conservation under the EC Habitats Directive, and the prospective marine protected areas selected under OSPAR Annex V, to ensure the necessary representation of geographical and ecological variation in the development of ecologically-coherent site networks.

7. MARINE LANDSCAPES

142. The concept of marine landscapes was developed from work undertaken by Roff and Taylor (2000) for Canadian waters. The purpose of the approach was to enable action to be taken to benefit nature conservation in circumstances where marine biological data are limited. Solving this problem is a significant issue for Canada because of its very extensive coastline and marine territory, and the relative scarcity of biological information. This same situation applies to the offshore waters of north-west Europe, including the UK and Ireland.
143. The central assumption of the marine landscapes concept is that geophysical and hydrographical information (for which there is generally better broadscale coverage than biological information) can be used in lieu of biological information to classify medium scale marine habitats and to set marine nature conservation priorities. The justification for this assumption is the very strong ecological relationship which exists between geophysical and hydrographic factors and the character of biological communities. There is an extensive scientific literature describing this ecological relationship, (e.g. Hiscock 1998 for the UK), and the relationship is used as the basis of both the UK (Connor *et al.*, 2003) and the European EUNIS marine habitat classifications (<http://mrs.wallonie.be/dgrne/sibw/EUNIS/EUNISHabitatslnk.xls>).
144. Roff and Taylor developed their classification using, in relation to the seabed, factors such as water temperature, depth/light, substratum type, exposure and slope, and, in relation to the water column, factors such as water temperature, depth/light and the stratification/mixing regime. The intention was that this classification would then be used to inform management action, including the taking of nature conservation measures.
145. In the UK, past practice has been to base nature conservation advice directly on biological data. In practice, however, the absence of good biological data for many offshore areas has meant that (except for advice in relation to seabirds where the data are more extensive) the development of such advice has, in many cases, either not been possible or has been precautionary. This is not a satisfactory basis on which to implement sustainable development. Nonetheless, while the scientific rationale for using geophysical and hydrographical information in lieu of biological information is strong, the approach does need validation to confirm that what was predicted when using a restricted set of data is a sufficiently accurate representation of what actually occurs.
146. Once the marine landscapes have been identified, consideration would need to be given to their relative value for nature conservation, and their susceptibility to harm from human activities.
147. Bearing the above points in mind, the work carried out under the Pilot had the following main components:
- i. the identification of marine landscape types for the Irish Sea using geophysical and hydrographical data;
 - ii. the biological characterisation of these marine landscapes using available data;
 - iii. the validation of the assumption that the marine landscapes identified reflect accurately the real-life situation and the biological character expected;
 - iv. an estimation of the value to nature conservation of the various marine landscapes, and their susceptibility to harm from the kinds of human activity most likely to affect them.

Methods

148. Following the data collation exercise reported in Chapter 4, bathymetry and seabed sediment data were converted from polyline to polygon format and merged with derived slope data in the GIS

- using a process called 'union'. This process combines the attributes of each dataset into one, allowing easier querying with the GIS. Other datasets, including generalised bedforms, maximum bed stress (bottom current) and gas seeps, were overlaid on this 'union' layer.
149. Practical criteria were developed to enable the separation of marine landscapes into distinct types. Key among these criteria were depth, substratum type, bed-stress/current strength, topography/slope and related factors. Account was taken, with respect to coastal (physiographic) features, of existing definitions (e.g. the definitions applied to Habitats Directive Annex I habitat types). A limitation of the British Geological Survey data was that the sediment datasets did not extend to shallow coastal waters and estuaries. Areas adjacent to the coastline, where British Geological Survey data were unavailable, were considered in the light of the datasets on benthic communities, and allocated to 'photic reef' or 'coastal sediment' marine landscape types on the basis of these communities.
 150. Biological characterisation was achieved by linking the available biological data to the relevant marine landscapes by joining the data spatially within the GIS, aggregating data to the biotope complex level of the national habitat classification. Because much of the biological data used were Irish Sea data, this method was to some extent self validating (i.e. it was possible to identify marine landscapes from geophysical and hydrographic data, **and** characterise them with actual biological data for the same areas). However, because biological data were sparse for offshore areas, the biological characterisation of marine landscapes which occur offshore was necessarily predicted by extrapolation from other data, and not confirmed.
 151. Two surveys were undertaken to validate whether the data used for the characterisation of seabed marine landscapes provided an accurate representation of the marine landscapes as they actually exist, and also that the marine communities observed reflected those that had been predicted. The surveys had the added benefit of providing new data for some types of marine landscape where previous data were particularly sparse. The first survey utilised the RV *Lough Foyle* to survey selected areas of the north-west Irish Sea, targeting a number of (Irish) sea mounds and the deep water channel. The second survey utilised the RV *Prince Madog* and targeted the coarse sediment plains, sand ripple areas and reefs to the north-west of Anglesey. A variety of data sampling techniques were used, including acoustic ground discrimination, sidescan, multibeam, video, still-photography and grab sampling.
 152. For the water column types, datasets previously discussed in paragraph 51 were used. An interpolation procedure was carried out on this 'model derived' gridded dataset. Stratification and salinity datasets were combined in a GIS using 'union'. Quarterly datasets were used, producing four seasonal maps, to reflect the seasonal variability in the hydrodynamic water column structure.
 153. The biological characterisation of the water column types was carried out using biological data supplied by the Sir Alastair Hardy Foundation for Ocean Science (SAHFOS). The biological data were provided in the form of gridded distribution maps for five key features of the plankton community in the Irish Continuous Plankton Recorder tows. The biological characterisation uses all the data that SAHFOS have available to them (i.e. the data used for this were not seasonal data). The five key features were: i. *Dinophysis spp.*, ii. *Coscinodiscus wailesii*, iii. decapod larvae, iv. fish larvae, v. total adult *Calanus*.
 154. *Dinophysis spp.* are a group of dinoflagellates which cause harmful algal blooms, and have been associated with Diarrhetic Shellfish Poisoning. *Coscinodiscus wailesii* is an important member of the phytoplankton assemblage, but is a non-indigenous diatom, originating from the Pacific. Decapod larvae are representative of the benthic component of the plankton assemblage. Fish larvae are representative of a higher trophic component in the plankton. Total adult *Calanus* comprises one of the most important components of the zooplankton community (a principal food source for higher trophic levels).

155. Work was carried out to assess the relative value of the marine landscapes for nature conservation. Some aspects of this are considered later in the chapters on nationally-important features and nationally-important areas, but, in addition, the individual marine landscapes identified for the seabed, were 'scored' for the number of biotope complexes that were found and/or were predicted to occur, to provide a simple measure of relative biological diversity.
156. The Marine Biological Association (MBA) through its *MarLIN* programme has collated information on the sensitivity of marine species and biotopes to the effects of human activities (www.marlin.ac.uk). The Pilot commissioned the MBA to evaluate methodologies for assessing and mapping the sensitivity of the marine landscapes (Tyler-Walters *et al.*, 2003). A sensitivity assessment was made for each of the offshore marine landscapes for which sufficient information on their physical characteristics and biotopes was available. The assessments were made against three main factors: substratum loss, smothering and physical disturbance. Sensitivity was assessed on the basis of whether the biotope groups characteristic of the marine landscape would survive a one-off impact.
157. However, this sensitivity assessment did not take account of actual, likely or potential patterns of exposure to human activities, and the results of the sensitivity work were subjected to a vulnerability assessment which took account of the likely relative exposure of the marine landscape to specific human activities. A matrix of relative vulnerability (following Gilliland, 2001) was used to combine sensitivity and exposure data in order to calculate relative vulnerability.

Results

158. Three main groups of marine landscapes were identified. These are:
- i. **Coastal (physiographic) marine landscapes** such as rias and estuaries where the seabed and water body are closely interlinked. In this group, both the seabed and the overlying water are included within the marine landscape;
 - ii. **Seabed marine landscapes** which occur away from the coast, i.e. the seabed of open sea areas. In this group, the marine landscapes comprise the seabed and water at the substrate/water interface;
 - iii. **Water column marine landscapes** of open sea areas, such as mixed and stratified water bodies and frontal systems. In this group, the marine landscapes comprise the water column above the substrate/water interface.

Coastal and seabed marine landscapes

159. In total, 18 coastal and seabed marine landscape types were identified for the Irish Sea. These are listed in Table 1, which also summarises the distinguishing geophysical and hydrographical characteristics of each type. The distribution of these 18 types is shown in Map 12. Notwithstanding that 'bays' are included on Annex 1 of the Habitats Directive, it was not found useful to identify a marine landscape type for them. Bays were not found to have any inherently distinguishing characteristics beyond that resulting from relative shelter from wave action, and it was considered preferable to define marine landscapes in bay areas on the basis of the seabed, not on that of the physiographic feature.
160. The biological characterisation of each of the coastal and seabed marine landscapes is summarised in Table 2. The biotope complex codes shown in the Table are those found in Connor *et al.* (2003).

Table 1: Summary of physical characteristics of each coastal and seabed Marine Landscape type

Marine Landscape	Depth (m)	Substratum	Bed-stress/ current	Topography/ slope & additional criteria
Estuary	0-30m	Mixed	Variable	Variable
Ria	Shallow: 0-20m	Typically rocky with sediment	Variable	A drowned river valley; often v-shaped in cross section
Saline Lagoon	V Shallow: 0-5m	Mixed	Weak currents	Parallel to coast, limited water exchange, large surface area: volume ratio
Sea loch	0-200m	Rocky with sediment basins	Variable	Includes fjords (have shallow sill & deep basins) & fjards (generally shallower)
Sound	0-30m	Gravels & sands	Strong currents	Narrow channel, open at both ends
Gas structures	Variable	Mixed	Very weak currents	Pockmarks/ depressions (hard structures)
Photic Reefs	Within photic zone (i.e. generally <10-20m for the Irish Sea)	Bedrock, boulders & cobbles	Variable	Rough/uneven topography Contains Littoral Rock and Infralittoral Rock
Aphotic Reefs	In aphotic zone (i.e. generally >10-20m for the Irish Sea)	Rock/biogenic	Variable (not as pronounced as Sea Mounds)	Rough topography
(Irish) Sea Mounds	Rising >20m above surrounding seabed	Rock, often with sediment veneer	Variable	Sea Mound slope > 1-8%
Sand/ gravel banks	Variable	Sands & gravels	Strong currents	Bank slope >1-8%
Coastal sediment	Intertidal -50m (& no BGS sediment data)	Muds, sands & gravels	Variable	Adjacent to coastline N.B. 'Bucket' category, where no BGS data were available.
Shallow-water mud basin	0-50m	Muds	Very weak currents	Depression
Deep-water mud basin	Deeper than 50m	Muds	Very weak currents	Depression
Fine sediment plain	Variable	Sands & muddy sands	Weak currents	Negligible slope
Sediment wave/ megaripple field	Variable	Sands	Moderate/strong currents	Waves/ripples
Low bed-stress coarse sediment plain	Variable	Cobbles, pebbles & muddy gravels	Low bed-stress	Negligible slope Evidence of fines in sediment
High bed-stress coarse sediment plain	Variable	Boulders, cobbles, pebbles & gravels	High bed-stress	Negligible slope No fines within sediment
Deep-water channel	Deeper than 150m	Cobbles, gravels & mixed sediments	Variable	Channel slope > 1-8%

Table 2: Summary of biological characterisation for each coastal and seabed Marine Landscape type

Marine Landscape	Characteristic biology (> 5% contribution)
Estuary	Fucoids on sheltered rocky shores; Fucoids in variable salinity conditions; Upper estuarine mud shores; mid estuarine mud shores; Mobile sandy shores; Muddy sandy shores LR.LLR.F; LR.LLR.FVS; LS.LMu.UEst; LS.LMu.MEst; LS.LSa.MoSa; LS.LSa.MuSa
Ria	Fucoids on sheltered rocky shores; Barnacles/fucoids on moderately exposed rocky shores; Mussels and barnacles on exposed rocky shores; Lichens; Tideswept kelp; Upper estuarine mud shores LR.LLR.F; LR.MLR.BF; LR.HLR.MusB; LR.FLR.Lic; IR.MIR.KT; LS.LMu.UEst
Saline lagoon	Upper estuarine mud shores; mid estuarine mud shores; muddy sand shores; Infralittoral sandy mud; Sublittoral seagrass beds I.S.I.Mu, UEst; L.S.L.Mu.MEst; L.S.LSa.MuSa; SS.SMu.IFiMu; SS.SMp.SSgr (characteristic biology for a typical saline lagoon from Bamber <i>et al.</i> , 2001)
Sea loch	Fucoids on sheltered rocky shores; Silted kelp; Brachiopod & ascidian communities; Circalittoral fine muds; circalittoral sandy muds; Circalittoral muddy mixed sediments; Sublittoral mussel beds LR.LLR.F; IR.LIR.K; CR.LCR.BrAs; SS.SMu.CFiMu; SS.CSaMu; SS.SMx.CMuMx; SS.SBR.SMus
Sound	Fucoids on sheltered rocky shores; Tideswept kelp; Circalittoral mixed faunal turf; Echinoderm and crustose communities; Infralittoral fine sands; Circalittoral coarse sediments; Infralittoral muddy mixed sediments LR.LLR.F; IR.MIR.KT; CR.HCR.XFa; CR.MCR.EcCr; SS.SSa.IFiSa; SS.SCS.CGvSa; SS.SMx.IMuMx
Gas structures	Offshore mud SS.SMu.OMu
Photic reef	Mussels and barnacles on exposed rocky shores; Barnacles/fucoids on moderately exposed rocky shores; Fucoids on sheltered rocky shores; Lichens; Rockpools; Kelp with cushion fauna/foliose red seaweeds/coralline crusts; Sand/gravel affected kelp communities; Kelp with red seaweeds LR.HLR.MusB; LR.MLR.BF; LR.LLR.F; LR.FLR.Lic; LR.FLR.Rkp; IR.HIR.KFaR; IR.HIR.KSed; IR.MIR.KR
Aphotic reef	Circalittoral tideswept fauna; Circalittoral mixed faunal turf; Echinoderm and crustose communities; Circalittoral vertical rock communities CR.HCR.FaT; CR.HCR.XFa; CR.MCR.EcCr; CR.FCR.FaV
(Irish) Sea Mounds	Rock structures with sediment veneer Offshore coarse sediments; Circalittoral sandy mud; Offshore mud; Sublittoral polychaete reefs; Circalittoral mixed faunal turf; Echinoderm and crustose communities SS.SCS.OCS; SS.SMu.CSaMu; SS.SMu.OMu; SS.SBR.PoR; CR.HCR.XFa; CR.MCR.EcCr
Sand/ gravel banks	Infralittoral fine sands; Infralittoral muddy sands; Infralittoral coarse sediments; Circalittoral muddy mixed sediment; Offshore mixed sediment; Sublittoral mussel beds. SS.SSa.IFiSa; SS.SSa.IMuSa; SS.SCS.CCS; SS.SCS.ics; SS.SMx.CMuMx; SS.SMx.OMx; SS.SBR.SMus
Coastal sediment	Fine sandy shores; Mobile sand shores; Muddy sand shores; Sublittoral estuarine mud; Infralittoral sandy mud LS.LSa.FiSa; LS.LSa.MoSa; LS.LSa.MuSa; SS.SMu.EstMu; SS.SMu.ISaMu
Shallow-water mud basin	Circalittoral sandy mud SS.SMu.CSaMu
Deep-water mud basin	Offshore mud; Circalittoral sandy mud SS.SMu.OMu; SS.SMu.CSaMu
Fine sediment plain	Circalittoral sandy mud; Infralittoral sandy mud; Circalittoral muddy sand; Infralittoral fine sands; Infralittoral muddy sands; Infralittoral coarse sediments SS.SMu.CSaMu; SS.SMu.ISaMu; SS.SSa.CMuSa; SS.SSa.IFiSa; SS.SSa.IMuSa; SS.SCS.ICs
Sediment wave/megaripple field	Circalittoral sandy mud; Circalittoral muddy sand; Infralittoral fine sands; Circalittoral fine sands Infralittoral coarse sediments; Circalittoral coarse sediments SS.SMu.CSaMu; SS.SSa.CMuSa; SS.SSa.IFiSa; SS.SCS.CCS; SS.SCS.ICs
Low bed-stress coarse sediment plain	Circalittoral mixed faunal turf; Infralittoral fine sands; Infralittoral muddy sands; Circalittoral gravels & sands; Infralittoral coarse sediments; Circalittoral muddy mixed sediment; Offshore mixed sediment CR.HCR.XFa; SS.SSa.IFiSa; SS.SSa.IMuSa; SS.SCS.CGvSa; SS.SCS.CCS; SS.SMx.CMuMx; SS.SMx.OMx
High bed-stress coarse sediment plain	Circalittoral mixed faunal turf; Circalittoral gravels & sands, Circalittoral pebbles & gravel; Offshore mixed sediment CR.HCR.XFa; SS.SCS.CGvSa; SS.SCS.CPbGv; SS.SMx.OMx
Deep-water channel	Offshore mixed sediment SS.SMx.OMx

161. The results of the two surveys were of considerable interest. The survey undertaken by the RV *Prince Madog* found that there was a good correlation between survey results and the marine landscapes identified from the geophysical and hydrographic data with respect to sediment wave/megaripple fields, and coarse sediment plains. Aphotic reef was validated in general but, in some areas, the actual substrate was more complex than the marine landscapes map indicated, with some admixture and overlay of gravel and finer sediments. The survey undertaken by the RV *Lough Foyle* validated the Irish Sea mounds as substantial rocky outcrops, but indicated that for at least some of the mounds surveyed (two of the four) a veneer of fine sediment of variable thickness composed was present upon the underlying rock in places.
162. In general, the predictions of biotope complexes were validated by the surveys, but, the nature of the communities present often depended on the fine structure of the habitat. For example, gravel areas also contained numbers of protruding boulders, reef areas were partly obscured by sediment veneers, and boulders fields also contained sand and shell in the interstices between the boulders. There is, therefore, a good level of confidence that the marine landscape types are ecologically relevant, although some aspects warrant further investigation.
163. The result of the work to map the biotope complex scores of the individual coastal and marine landscapes is shown in Map 13. It must be emphasised that these scores are a measure of biotope richness, and they also partly reflect survey effort, so should be used cautiously when making judgements with respect to nature conservation value. To give a true picture of the latter, other factors such as the relative rarity of individual marine landscapes, and the conservation value of the species and habitats they support, would also need to be taken into consideration. These are issues which are given further consideration in the two following chapters.

Water column marine landscapes

164. In total, 4 water column marine landscape types were identified. The geographical distribution of these is shown in Map 14, and the hydrographical and physical conditions of each is shown in Table 3.

Table 3: Water column types: physical/hydrographical definitions

Water Column types	Number of days stratified (annual)	Salinity (Dec-Feb)
Mixed and High Salinity	< 40 days	> 34‰
Mixed and Low Salinity	< 40 days	≤ 34‰
Stratified and High Salinity	≥ 40 days	> 34‰
Stratified and Low Salinity	≥ 40 days	≤ 34‰

165. The biological characterisation used the same process of spatial joining discussed in paragraph 148. Point values from this grid were spatially joined to the underlying Water Column type, giving a set of abundance values for each water column type. For each dataset, an average abundance was calculated, to give mean abundance per 3m³. The results can be seen in Table 4.

Table 4: Mean abundance (per 3m³) of key plankton community features in the Irish Sea

Key Plankton Community Features	Water Column Types			
	Mixed & High Salinity	Mixed & Low Salinity	Stratified & High Salinity	Stratified & Low Salinity
	Mean abundance per 3m ³			
Fish Larvae	1.19	1.24	1.17	1.23
<i>Dinophysis spp.</i>	1.13	1.38	1.52	1.61
Decapod larvae	1.98	2.80	2.14	3.07
Total adult <i>Calanus</i>	1.91	1.44	2.32	1.45
<i>Coscinodiscus wailesii</i>	1.06	1.23	1.08	1.31

166. The 'Mixed and High Salinity' type is characteristic of waters found in the area of the central Irish Sea. Compared to the other types, it has an impoverished plankton community and has the fewest number of phytoplankton taxa. There are no plankton taxa specific to this type.
167. The 'Mixed and Low Salinity' type, in particular around Liverpool Bay, is regularly an area of *Phaeocystis* bloom formation. In addition to *Phaeocystis*, two other species form exceptional blooms in this area: the dinoflagellate *Gyrodinium aureolum* (which produces 'red tides' and occurs in the inshore waters of south-east Liverpool Bay and the Solway Firth) and the luminescent *Noctiluca scintillans*. The 'red tides' caused by *Gyrodinium aureolum* are of particular importance to coastal managers as they have been linked to invertebrate mortalities (Edwards & Johns, 2003).
168. The 'Stratified and High Salinity' type has plankton communities indicative of higher salinity waters and possesses the most diverse zooplankton community of the 4 types. The plankton community contained numerous oceanic species, such as *Calanus helgolandicus* and the area-specific taxon Coccolithaceae, particularly in the south of the Pilot area where the assemblage reflects oceanic inflow from the warmer southern waters.
169. The 'Stratified and Low Salinity' type has the highest mean abundance of *Dinophysis* spp., which is associated with Diarrhetic Shellfish Poisoning.
170. In addition to the 4 water column types, the data indicate a number of areas of water mixing or 'frontal zones', where there is evidence of higher than normal productivity. These include seasonal fronts, resulting from the stratification of the water column in summer, and a salinity front in the Liverpool Bay area which is a permanent feature throughout the year (Edwards and Johns, 2003). The approximate position of these fronts is shown in Map 14.
171. The Liverpool Bay front has the highest phytoplankton biomass and zooplankton abundance of all the 4 water column types (Edwards and Johns, 2003). Its phytoplankton colour index value (an assessment of total phytoplankton biomass), and copepod abundance value (an assessment of secondary biomass), were both about twice those of the other types.
172. The north-east basin of the Irish Sea which incorporates the Liverpool Bay front zone, the 'Mixed and Low Salinity' and the 'Stratified and Low Salinity' water column types, is an area with a high benthic component to the zooplankton assemblage (including Decapod larvae). Another important aspect of the zooplankton assemblage within the three water column types in this area, is that it contains the eggs/larvae of many commercially-exploited species.
173. The Pilot reviewed the distribution data for a range of pelagic vertebrates, including seabirds, cetaceans and basking shark, but was unable to identify clear correlations with the water column marine landscape types or fronts. This may be a result of inadequacies of the data, but may also be due to weak effects of the different water column features on adult vertebrate populations, at least in the Irish Sea. An exception to this general conclusion is that there is some evidence that seabird numbers in summer are concentrated in the vicinity of the seasonal western Irish Sea front. However, full consideration of the correlation between fronts and vertebrate distribution patterns, and indeed between fronts and water column marine landscapes, requires further consideration.

Sensitivity of coastal and seabed marine landscape types

174. Table 5 summarises the results of the exercise referred to in paragraphs 156-157 to assess the sensitivity and vulnerability of coastal and seabed marine landscapes.

Table 5 Assessment of relative vulnerability to different human activities at the marine landscape scale in the Irish Sea

Relative vulnerability of the marine landscape

Relative sensitivity of the marine landscape

Categories of activity which may cause deterioration or disturbance	Examples of human activities	Estuary	Ria	Saline Lagoon	Sea loch	Sound	Photic reefs	Aphotic reefs	Shallow water mud basins	Deep water mud basins
Substratum loss	Coastal development	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●
	Offshore development	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●
	Aggregate extraction	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●
	Capital dredging	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●
	Maintenance dredging	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●
	Tractor dredging for shellfish	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●
Smothering	Disposal of dredged spoil	●●●	●●●●	●●●●	●●●●	●●●	●●●	●●●	●	●
	Maintenance dredging	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●	●●
Physical disturbance or abrasion	Suction dredging for shellfish	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●	●●
	Tractor dredging for shellfish	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●	●●
	Beam trawling	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●	●●
	Scallop dredging	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●	●●
	Demersal otter trawling	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●	●●
	Anchoring	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●	●●
	Mussel harvesting	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●	●●
	Recreational activities	●●●	●●●	●●●	●●●	●●●	●●●	●●●	●●	●●
Categories of activity which may cause deterioration or disturbance	Examples of human activities	Coastal sediment	Fine sediment plains	LBS coarse sediment plain	HBS coarse sediment plain	Sediment wave/megaripple field	Sand/gravel banks	Sea mounds	Deepwater channel	Gas structures
Substratum loss	Coastal development	●●●	●●●	●●●	●●●	●●●	●●●	●●●	*	*
	Offshore development	●●●	●●●	●●●	●●●	●●●	●●●	●●●	*	*
	Aggregate extraction	●●●	●●●	●●●	●●●	●●●	●●●	●●●	*	*
	Capital/maintenance dredging	●●●	●●●	●●●	●●●	●●●	●●●	●●●	*	*
	Tractor dredging for shellfish	●●●	●●●	●●●	●●●	●●●	●●●	●●●	*	*
	Suction dredging for shellfish	●●●	●●●	●●●	●●●	●●●	●●●	●●●	*	*
Smothering	Disposal of dredged spoil	●●	●●	●●	●●	●	●	●●●	*	*
	Capital/maintenance dredging	●●●	●●●	●●●	●●●	●	●	●●●	*	*
Physical disturbance or abrasion	Suction dredging for shellfish	●●●	●●●	●●●	●●●	●	●	●●●	*	*
	Tractor dredging for shellfish	●●●	●●●	●●●	●●●	●	●	●●●	*	*
	Beam trawling	●●●	●●●	●●●	●●●	●	●●	●●●	*	*
	Scallop dredging	●●●	●●●	●●●	●●●	●	●●	●●●	*	*
	Demersal otter trawling	●●●	●●●	●●●	●●●	●	●●	●●●	*	*
	Anchoring	●●●	●●●	●●●	●●●	●	●●	●●●	*	*
	Mussel harvesting	●●●	●●●	●●●	●●●	●	●●	●●●	*	*
	Recreational activities	●●●	●●●	●●●	●●●	●	●●	●●●	*	*

175. It should be emphasised that Table 5 assesses only the widespread biological components of marine landscapes. While, therefore, it can be used for assessing the likely impacts of human activities at the broad scale, it does not have regard to smaller scale habitats of high conservation value (e.g. eelgrass beds or horse mussel beds), nor to factors relevant to maintaining population biomass or food webs, nor to the needs of nationally-important species. For local spatial planning purposes, therefore, particularly in coastal areas where there is a high degree of habitat complexity, these other aspects of biological importance will also need to be taken into account. Similarly, when taking regulatory decisions, all available information needs to be taken into consideration, including information from environmental impact assessments.

176. Nonetheless, the application of sensitivity and vulnerability assessments at the marine landscape scale is potentially very useful, particularly in offshore waters, and the further development and refinement of assessment methods is likely to prove very worthwhile.

Discussion

177. The Pilot has demonstrated that the identification and mapping of a comprehensive series of marine landscape types using geophysical and hydrographical data is fully practicable at the Regional Sea scale. The series of 18 coastal and seabed, and 4 water column marine landscapes identified for the Irish Sea by the Pilot may well need some refinement following further work, but is probably transferable with relatively little modification to adjacent sea areas of broadly similar character such as the eastern Celtic Sea, the English Channel and the North Sea.
178. For a variety of reasons, including the steepness of the slope of the continental shelf, the presence of sea mounts, a range of glacial features such as iceberg plough marks, and the occurrence of much deeper water than occurs in the Irish Sea, the classification framework developed under the Pilot would need to be extended for use in areas to the south and west of Ireland, west of the Hebrides and north of Scotland. However, the basic concept is sound.
179. There was, generally, a good correlation between the marine landscapes identified and the character of the seabed. But partly because of the inherent simplification which took place in the generation of the marine landscapes, and partly because the substrate data did not always reflect the actual condition of the seabed surface, there was greater variability than a straightforward interpretation of the marine landscape map would have suggested. The same is true of the biological characterisation; in general the relation between marine landscapes and biological communities is very strong, but locally there can be considerable variation and complexity.
180. Marine landscapes can be used to predict the susceptibility of human impacts on their biological communities but there is a need to use some caution in this. Many of the biological communities which presently occur reflect some modification of the natural state as a result of human activity and this could have implications for the conclusions reached. For example, areas of seabed subject to strong currents where sediments are mobile could be expected to support biological communities capable of accommodating a level of physical disturbance. If these communities were considered natural for such an area, human activity causing similar disturbance might, therefore, be assumed to be relatively harmless. However, species-rich biogenic reefs may have developed in these areas but have been destroyed by dredging or trawling activity. Continuation of such activities would ensure that such reefs would not re-establish.
181. The value of the marine landscapes approach is that it uses data which are currently available to enable management strategies for the marine environment to be developed and implemented. It is only to be expected, however, that mapped habitat information derived from future biological survey will be more accurate than marine landscape maps developed largely from geophysical and hydrographical data. As such survey information becomes available over time, marine landscape maps will need to be refined to accommodate it.
182. The Water Framework Directive requires the achievement of good ecological status in transitional and coastal waters. Good ecological status is defined as where the biological quality elements show only low levels of distortion resulting from human activity, deviating only slightly from those normally associated with the surface waterbody type under undisturbed conditions. Links could be made between the marine landscape types defined here and the habitat types defined for deriving reference conditions for water bodies for the Water Framework Directive (which are at a more detailed scale). The Water Framework Directive also requires water bodies to be risk assessed in terms of human pressures and sensitivities and the risk of failing to achieve good ecological status.

Recommendations

183. The following recommendations are made with respect to Marine Landscapes:

R14 The marine landscape approach should be adopted as a key element for marine nature conservation and utilised in the spatial planning and management of the marine environment. The approach should take account of broadscale marine habitat information, as this information becomes available over time. In coastal and estuarine waters the approach should seek to complement that taken under the Water Framework Directive (in relation to typology and reference conditions) at a more detailed level.

R15 A list of internationally-agreed marine landscapes for the north-east Atlantic should be developed. It is suggested that the list identified for the Irish Sea be expanded to include landscapes not found in the Irish Sea and further refined as necessary. Work to complete the mapping of these marine landscapes in the north-east Atlantic should be undertaken in collaboration with other countries.

R16 The methodology for sensitivity and vulnerability of marine landscapes should be further developed and refined, having due regard to relevant standards being developed in relation to the Water Framework Directive. It should be recognised that for purposes of local spatial planning, these assessments should be enhanced using the additional biological information which is available in inshore and coastal environments.

184. A full report of the work carried out on marine landscapes is available (Golding *et al.*, 2004, and online at www.jncc.gov.uk/irishseapilot)

8. NATIONALLY-IMPORTANT MARINE FEATURES

185. The rationale behind identifying threatened, rare or otherwise exceptional species and habitats for priority conservation attention is that, unless urgent action is taken, such species and habitats could either be driven to extinction or reduced to tiny populations or residual areas. Examples of this approach to conservation are to be found in the international and national series of Red Data Books, in the Bern Convention, in the EC Birds and Habitats Directives, and in national species protection legislation. The approach is also an important component of the work being undertaken in relation to OSPAR Annex V.
186. In the UK, this approach has also been followed in the preparation of Biodiversity Action Plans for a range of priority habitats and species, as a significant contribution towards the national implementation of the Convention on Biological Diversity. In the terrestrial environment at least, these Action Plans have channelled a great deal of national and local endeavour into the conservation of the priority features. Some 60 Action Plans relate to marine species and habitats, but the marine environment presents a number of particular challenges for Action Plan implementation.
187. One of the tasks identified by the Review of Marine Nature Conservation was the need to determine how to select nationally-important marine features for the UK (taken to include marine landscapes, habitats and species), and how to conserve such features in practice. As part of this work, JNCC was requested to develop draft criteria for the identification of nationally-important marine features. Drawing extensively upon previous and current work in other fora, notably IUCN, OSPAR and the EC Habitats and Birds Directives, a criteria paper was prepared (Connor *et al.*, 2002), which contained an outline rationale and a suite of draft criteria, together with indicative threshold values for using these criteria. The paper was endorsed by the Review of Marine Nature Conservation Working Group for the purpose of trialling as part of the Pilot.
188. Following on from the work to identify nationally-important features was the need to consider the conservation requirements of these features and the appropriate mechanisms for achieving their practical conservation.

The draft criteria

189. The draft criteria for the identification of nationally-important marine features fall into two groups. Firstly, there are criteria to identify features of special importance; secondly there are criteria to identify features which are threatened or declining.
190. Features of special importance include those whose distribution is focussed on the UK, where the UK may host a particularly high proportion of the feature in a regional or global context, and, consequently, have a special responsibility for their conservation. Additionally, within the UK, certain features are worthy of special recognition because of their rarity.
191. The criteria for the identification of features of **special importance** are given in Connor *et al.* (2002) as follows:

Proportional importance:

A high proportion of the marine landscape, habitat, or population of a species (at any time of its life cycle) occurs within the UK. This may be related to either the global or north-east Atlantic/European extent of the feature, with global importance being of greater significance.

Features may be categorised as follows:

Globally important:

a high proportion of the global extent of a marine landscape or habitat or a high proportion of the global

population of a species (at some stage in its life cycle) occurs within the UK. 'High proportion' is considered to be more than 50%, when known.

Regionally important:

a high proportion of the regional (north-east Atlantic) extent of a marine landscape or habitat, or a high proportion of the regional population of a species (at some stage in its life cycle) occurs within the UK. 'High proportion' is considered to be more than 50%, when known.

Rarity:

Marine landscapes, habitats and species that are sessile or of restricted mobility (at any time in their life cycle) are considered rare if their distribution is restricted to a limited number of locations. Rarity can be assessed at global, regional or national level as follows:

Globally rare: no guidelines available.

Regionally rare: the 'limited number of locations' is set at 2% of the 50 km by 50 km UTM grid squares for each of the following three bathymetric zones in the north-east Atlantic:

- a. littoral (intertidal zone and splash zone);
- b. sublittoral (down to 200 m depth);
- c. bathyal / abyssal (below 200 m depth).

Nationally rare: recorded in 1-8 of the 10 km x 10 km squares in GB (i.e. less than 0.5% of the total numbers of squares - based on the numbers of 10 km squares in which the feature is recorded in comparison with the total number of squares within the 3 nm limit). In the case of a mobile species, the total population size will determine rarity.

The assessment should be dependent on scientific judgement regarding natural abundance, range or extent and the adequacy of recording.

192. Previous nature conservation policy has accorded a high priority to features that have declined significantly in extent or quality, or which are under threat of such decline. This element of the overall approach to nature conservation needs to be retained as an essential part of the conservation framework. Failure to take measures to conserve such features is likely to lead to their being lost.

193. The criteria for **declining or threatened features** given by Connor *et al.* (2002) are the following:

Decline: an observed, estimated, inferred or suspected significant decline in numbers, extent or quality of a marine landscape, habitat or species (for species, quality refers to life history parameters). The decline may be historic, recent or current and may be throughout UK waters, or at a regional or global level.

	Extent	Quality
Marine landscapes and habitats	A marine landscape or habitat that has declined in extent to 90% or less of its former natural extent in the UK, or its distribution within the UK has become significantly reduced (e.g. lost from several sub-regions).	A marine landscape or habitat for which quality, based on change from natural conditions caused by human activities, is negatively affected by: (1) a change of its typical or natural components over almost the entire UK, or (2) the loss of its typical or natural components in several sub-regions. Such judgement is likely to include aspects of biodiversity, species composition, age composition, productivity, biomass per area, reproductive ability, non-native species and the abiotic character of the habitat.

	Extent	Quality
Species	A population of a species occurring in the UK is defined as significantly declined: if numbers of individuals show an extremely high and rapid decline in the area over an appropriate time frame, or the species has already disappeared from the major part of its former range in the area, or if numbers of individuals are at a significantly low level due to a long, continuous and distinct general decline in the past.	The species has suffered a significant decline in one or more of the following: <ul style="list-style-type: none"> ● Loss of genetic diversity ● Loss of fecundity ● Reduction in the number of mature individuals ● Fragmentation of the population

194. Assessments of decline should be those that occur beyond what is known about long-term natural variability and resilience, as well as in an appropriate time frame for that feature.

195. Lesser degrees of decline than 'significantly declined' will occur but will not qualify under this criterion. Evidence for decline can be based on actual evidence or reasonable expert judgement. The percentages suggested for categorizing habitat decline reflect the fact that habitats are far less likely to recover from even a small percentage loss compared to most species.

Threat of significant decline: the feature is expected to suffer significant decline in the foreseeable future due to its expected high level of exposure to damaging activities and to its inherent sensitivity to those activities. Where such potential decline is inferred or estimated, a precautionary approach should be adopted.

196. Sensitivity accounts for both the ease of damage to the feature by the activity and to its ability to recover from that damage. Sensitivity factors include, for example, smothering, loss of substratum and abrasion resulting from human activities.

197. The following table offers a way of integrating relative sensitivity and the degree of exposure to damaging activities to give a threat of significant decline rating (equates to vulnerability) (Gilliland, 2001).

Degree of exposure	Sensitivity			
	High	Moderate	Low	None detectable
High	High	High	Moderate	N/A
Medium	High	Moderate	Low	N/A
Low	Moderate	Low	Low	N/A
None	N/A	N/A	N/A	N/A

Methods

198. In order to develop a comprehensive list of nationally-important marine features, ideally all UK marine features should be tested against the criteria. It is unlikely that such a monumental task is achievable realistically, and it would certainly not be cost-effective. A list of those features thought likely to meet the criteria was, therefore, compiled initially to create a 'provisional' list.

199. The provisional list was compiled from features which are currently considered to be of conservation concern by other fora, e.g. OSPAR, IUCN, the Habitats Directive and the Birds Directive, together with species that were listed as nationally rare by Sanderson (1996). Expert review of this list resulted in some additions and deletions.

200. For the purpose of the Pilot, a list of nationally-important features which occur in the Irish Sea was needed. A subset of the provisional list was, therefore, created, containing those features which are known to occur in the Irish Sea (the Irish Sea provisional list).

201. The criteria were then tested by selecting a sample set of 25 'test' features selected from the Irish Sea provisional list, and applying the criteria to them. The test features were selected so as to cover all levels of feature (marine landscapes, habitats and species). The test species were selected to cover a broad range of taxonomic groups; this was to ensure that the criteria would be tested on the broadest range of feature types possible within the constraints of the Pilot. The sample of 25 'test' features represents approximately 10% of the features on the Irish Sea provisional list.
202. The work to test the criteria was carried out partly by JNCC (16 features), and partly by *MarLIN* (9 features). The criteria were applied to the test features by drawing up dossiers for each feature. The dossiers drew together information relating to each criterion in turn. Information sources used were those readily available to JNCC, including the JNCC marine reports and reprints collection, the internet, and the scientific literature available online. *MarLIN* had access to similar information and to the library resources of the Marine Biological Association.
203. Under the 'proportional importance' criterion, information on national and global species distribution and population numbers was researched. Exact information on what proportion of the global resource of a feature occurs nationally is usually unavailable. Therefore, inferences were often made from existing information on global distribution patterns and national/regional/global population sizes.
204. The 'rare' criterion was adopted from work originally carried out by Sanderson (1996), who assessed the rarity of UK marine benthic species based on information in the Marine Nature Conservation Review database. All features listed as 'rare' in Sanderson (1996) were accepted as meeting the 'rare' criterion.
205. The 'decline' and 'threat of decline' criteria were assessed by searching readily-available sources for relevant information. Exact information of percentage declines in the national resource of a feature is rarely available, but, in many cases, there is sufficient information to provide robust evidence for significant levels of decline or threat. In some cases, more tenuous inferences have to be drawn from the available data.
206. In order to investigate the extent to which the Irish Sea data used in the exercise reflected the true extent of knowledge of species and habitat distribution, the Marine Biological Association was commissioned to undertake an intensive literature search, and to contact individuals and institutions which might hold relevant information, on 48 of the features on the Irish Sea provisional list, to see how much additional information might be available.
207. In order to identify areas with high concentrations or clusters of records of nationally-important features, those features on the Irish Sea provisional list where relevant information was available were mapped in a GIS. Benthic features (benthic invertebrates, algae, and habitats) were mapped from records on the JNCC marine database. Seabird, cetacean and basking shark distribution maps were generated from data supplied by JNCC and the Marine Conservation Society.

Results

208. The result of the criteria testing was that 18 of the 25 features tested qualified as nationally-important features (i.e. they met one or more of the criteria), one feature was borderline, two features failed to meet any of the criteria, and for 4 features there proved to be insufficient data to make the assessment. The features tested and the results of the assessment are given in Table 6.

Table 6: Results of applying the criteria to the 25 test features.

The first three columns identify the test features. The subsequent four columns show which criteria they meet or fail, or indicate that insufficient information was available to carry out the assessment. The column labelled NI shows the overall result of the assessment (yes - nationally-important; no - not nationally important; ? - unknown).

Abbreviations:

PI = Proportional Importance;

R = Rare;

D = Decline;

T = Threat of significant decline;

NI = Nationally Important;

yes = indicates criterion is met and the feature therefore qualifies as nationally important;

yes* = probably meets criterion based on available information;

(yes) = borderline case;

poss. = possibly meets criterion;

no* = probably does not meet criterion;

no = does not meet criterion;

? = not enough information found to carry out assessment

Test Feature	Common name	Feature Type	PI	R	D	T	NI	Comments
<i>Axinella damicornis</i>	Sponge	Species	?	no	?	?	?	Minimal information available
<i>Balanophyllia regia</i>	Scarlet and gold star coral	Species	no	no	?	?	?	Minimal information available
<i>Eunicella verrucosa</i>	Pink seafan	Species	no	no	?	poss	no	Suffers from lack of information despite recent research programmes
<i>Funiculina quadrangularis</i>	Tall sea pen	Species	no	no	yes	yes	yes	Suffers from lack of information despite recent research programmes
<i>Atrina fragilis</i>	Fan mussel	Species	no	yes	yes	yes	yes	
<i>Palinurus elephas</i>	European spiny lobster	Species	no	no	yes	yes*	yes	
<i>Cetorhinus maximus</i>	Basking shark	Species	?	yes*	yes	yes	yes	Suffers from lack of information
<i>Dipterus oxyrinchus</i>	Long-nosed skate	Species	no	yes	yes*	yes*	yes	
<i>Gadus morhua</i>	Cod	Species	no	no	yes	yes	yes	Much relevant info available.

Test Feature	Common name	Feature Type	PI	R	D	T	NI	Comments
<i>Lophius piscatorius</i>	Sea monkfish	Species	no	no	?	yes	yes	Possibly more information available especially with respect to past declines
<i>Alosa alosa</i>	Allis shad	Species	no	no*	yes	yes	yes	Some populations may be locally extinct. Decline may be reversed in some areas
<i>Puffinus puffinus</i>	Manx shearwater	Species	yes	?	?	poss.	yes	Much information available
<i>Halichoerus grypus</i>	Grey seal	Species	(yes)	no	no	poss.	(yes)	Meets criterion for proportional importance at regional but not at global level. This is a 'borderline' case.
<i>Callophyllis cristata</i>	Red seaweed	Species	?	?	?	?	?	Minimal information available
<i>Anotrichium barbatum</i>	Bearded Anotrichium	Species	no	yes	yes	yes	yes	Decline may be due to natural variability.
<i>Ostrea edulis</i> beds	Native oyster beds	Habitat	no	no	yes	yes	yes	Best considered at habitat level, though would also qualify at species level.
<i>Limaria hians</i> beds	File shell beds	Habitat	?	?	yes	yes	yes	Inferences made from information about the species <i>Limaria hians</i> as little/no information found regarding the habitat.
<i>Sabellaria spinulosa</i> reefs	Ross worm reefs	Habitat	?	yes*	yes	yes	yes	Suffers from lack of information and different definitions of habitat

Test Feature	Common name	Feature Type	PI	R	D	T	NI	Comments
<i>Modiolus modiolus</i> beds	Horse mussel beds	Habitat	no	no	yes	yes	yes	Best considered at habitat level. Suffers from lack of information and different definitions of habitat
CR.HCR.DpSp	Deep sponge communities	Habitat	poss	(yes)	no*	poss	?	More data analysis required
IR.HIR.Ksed.XKT	Tide swept kelp and seaweed communities	Habitat	?	no	yes*	yes	yes	
LS.LMX.LMUS	Intertidal mussel beds	Habitat	no	no	no	no	no	
Estuaries	Estuaries	Marine landscape	no	no	yes	yes	yes	Should meet proportional importance criterion - criterion threshold set too high. Meets 'decline' criterion in terms of decline in quality.
Deep-water mud basins	Deep-water mud basins	Marine landscape	no*	no	yes*	yes	yes	
Sealochs	Sealochs	Marine landscape	yes	no	yes*	yes*	yes	

209. The above results are of interest in themselves, but at least of equal significance were the conclusions gained from using the methodology. The main problem encountered with the method was the general insufficiency of data, and quite a number of judgements had to be made inferring conclusions from available information. For example, because quantitative information on national and global species populations is rare, 'proportional importance' often had to be inferred from different, though probably related, information such as the global distribution of the species (i.e. by assuming that species which are relatively widely distributed globally are likely to have a larger proportion of their population outside the UK than those having a much more restricted distribution). Similar inferences had to be made in the application of other criteria such as 'decline' and 'threat'. As a consequence, it is important that criteria are worded so as to allow the use of such inferences based on best scientific judgement, e.g. by using phrases such as 'believed or inferred decline', but ensuring that judgements are as rigorous as possible. Were strict quantitative thresholds insisted upon, it would be difficult to apply the criteria for all but a small minority of features. Even so, there will be a number of features for which, for the foreseeable future, there will be insufficient information to reach a clear decision.

210. There is a potential problem in using the criteria when applied to the marine landscapes because, except for types such as 'estuaries' for which spatial information is available, the relative extent of most has not yet been determined for the UK because the typology has only just been developed. However, this problem is one which can be overcome with further work.

211. It was found that there was no clear-cut level within the hierarchical structure of the National Marine Habitat Classification (Connor *et al.*, 2003) at which to identify habitats for the purpose of

testing. The testing exercise was applied initially at the biotope complex level (e.g. sublittoral mussel beds), but this included common mussel *Mytilus*-dominated biotopes as well as horse mussel *Modiolus modiolus* beds, and it may be necessary to use a lower level of the classification. In some cases, notably for reef forming species, the species might be common, but the habitat, which the species can form, is scarce. For example, Ross worm *Sabellaria spinulosa* is fairly widespread, but reef structures formed by this species are threatened and declining because of bottom trawling. The level at which habitats should be tested, therefore, is best determined by judgement on a case-by-case basis.

212. As a result of the testing exercise, it is recommended that the criteria be modified somewhat, so as to improve their applicability and to simplify the process for applying them. The recommended revisions are shown in Appendix 4.
213. The distribution of benthic species and habitats on the Irish Sea provisional list is shown in Map 15. Because of the relative lack of data in offshore waters, their distribution in those waters is likely to be under-represented.
214. For pelagic species, the distribution of seabird species on the provisional list in terms of relative species richness is shown in Map 16 for Irish Sea waters away from the immediate coast. Areas with the highest biodiversity index values tend to be concentrated in the Clyde Sea, the western half of the central Irish Sea, St George's Channel and close inshore around Pembrokeshire and off North Wales and Anglesey.
215. The results of the additional data search carried out by the Marine Biological Association were that no new records of any of the habitats could be found, but some new species records were located and were entered onto the database. It was concluded that the existing JNCC marine data base, though it will contain some gaps, is a cost-effective tool to use for the purpose of applying the criteria to benthic features. In undertaking future work on nationally-important features, it may only prove cost-effective to carry out such additional data searches where there are known significant gaps in the existing database or where there is reason to believe that the addition of further records will materially affect the outcome of the assessment.

Discussion

216. The draft criteria were fairly straightforward to apply, though time-consuming. Difficulty did arise as a result of the lack of data internationally, particularly with respect to the assessment of species populations, and habitat extent. Nonetheless, with the modifications proposed in Appendix 4, the criteria can be used effectively and produce results which assess consistently whether marine landscape, habitat and species features should be considered to be of national importance.
217. The practical conservation of nationally-important features is not straightforward. It is anticipated, from the work carried out to date, that in the order of 300 features might meet the criteria in the UK and adjacent waters, of which perhaps half will occur in the Irish Sea. These features will range from relatively static benthic features known from only one or two localities, to highly mobile, wide-ranging species. Some features will be conspicuous and easy to identify, others will be inconspicuous or difficult to differentiate from ones which are similar in appearance but which are not nationally-important. The approach needed to conserve the various features can be expected to differ considerably across the range of features.
218. In general, the features are likely to fall into one or more of the following categories:
 - i. features whose distribution is clustered and centred on a small number of distinct localities for all or most of the year;
 - ii. features which form aggregations in predictable localities during at least part of the year;

- iii. features which are widely but thinly distributed, though everywhere uncommon;
 - iv. species which are mobile, occurring as individuals or in small or even large groups, and which may be vulnerable to capture fisheries;
 - v. species which are vulnerable to disturbance resulting from human-induced noise, vibration or movement;
 - vi. features which have narrow tolerances in relation to water conditions or which are vulnerable to pollution;
 - vii. species which are relatively mobile and which are at the edge of their range in national waters.
219. While needs will vary across the range of features, the types of measures needed to conserve nationally-important features are likely to include:
- i. zoning of human activities so as to avoid damage or disturbance to sensitive areas, within a wider framework of spatial planning. This zoning would include the identification of areas of particular value to nature conservation where human activity would be carefully managed;
 - ii. measures to reduce the impact of the incidental take of vulnerable mobile species by capture fisheries;
 - iii. measures to reduce human-induced noise, vibration or movement;
 - iv. measures to ensure the maintenance or improvement of water quality conditions, or the avoidance of pollution;
 - v. measures aimed at maintaining the physical and biological processes that support marine ecosystems, including the maintenance of their trophic structure;
 - vi. Action Plans to address the specific needs of particular features.
220. Further work needs to be carried out to determine the balance of measures outlined in paragraph 219 across the features. It may prove cost-effective to undertake this scoping work, initially, in relation to features on the provisional list since a number of the measures will be required to conserve a wide range of other biodiversity features, and additional action to conserve nationally-important features of similar type may not be necessary. Where it appears that specific Action Plans would be needed for particular features, the criteria could then be applied to those features to ensure that they are, indeed, nationally-important and that such action is required.
221. It should be noted that one of the test species which failed the test criteria, the Pink seafan, is a Biodiversity Action Plan priority species. This fragile and attractive species is potentially threatened by mechanical damage and by collecting, and the conservation measures taken to support it are considered to be helping to maintain its populations. In circumstances such as these, the Pilot recommends the maintenance of existing conservation measures.
222. It is desirable that a single national process is operated in relation to the identification of nationally-important features and the identification of action needed to conserve them. The Pilot considers that it would be desirable, therefore, to combine the process recommended here with the current Biodiversity Action Plan process in relation to marine features.
223. Measures to address the needs of nationally-important features are discussed further in Chapters 9, 12 and 13 of this report.

Recommendations

224. The following recommendations are made with respect to nationally-important marine features:

R17 The criteria for the identification of nationally-important marine features, as modified and shown in Appendix 4, should be adopted by the UK subject to any refinement that may be needed following further discussion with other countries through EU and OSPAR. The upper and lower ends of the range of nationally-important features should be marine landscapes and species respectively, but the scale at which habitats are selected should be left to judgement in the light of relevant circumstances.

R18 Further work should be carried out to determine which nationally-important features may require specific Action Plans. A single national process, including work undertaken under the UK Biodiversity Action Plan in relation to marine features, should be operated in the identification of nationally-important features and of the action needed to meet their conservation requirements.

225. A full report of the work carried out on the nationally-important features is available (Lieberknecht *et al.*, 2004a, and online at www.jncc.gov.uk/irishseapilot).

9. NATIONALLY-IMPORTANT MARINE BIODIVERSITY AREAS

226. Within the draft framework for marine nature conservation, the identification of nationally-important areas is seen less as a separate level of the framework than as an important mechanism for delivering conservation of those marine landscapes, habitats and species which have the most overall value for nature conservation and which are also susceptible to harm from human activities.
227. However, conceptually, the issue of important areas merits attention in its own right. The value of identifying areas of particular importance for biodiversity is based on the principle that these areas make such an essential contribution to meeting the objective of maintaining the range and scale of biodiversity present in the country, that, unless they are enabled to maintain this contribution in perpetuity, this objective will not be met.
228. Furthermore, current thinking on the role of important areas within an overall nature conservation strategy is that these areas should be seen not (or not only) in isolation as individual areas but also as components of an ecologically-coherent network of areas. Individual areas within this network should have the capability of supporting one another ecologically, and also of supporting, and being supported by, the areas of sea and seabed adjacent to them.
229. One of the tasks identified by the Review of Marine Nature Conservation was to develop a clear rationale and justification for a series of nationally-important areas for biodiversity in the marine environment, and a suite of agreed criteria for selecting them. As part of this work, JNCC was requested to develop draft criteria. Drawing extensively upon existing and current work in other fora, notably the selection guidelines for Sites of Special Scientific Interest, the EC Habitats and Birds Directives, IUCN and OSPAR, a criteria paper (Connor *et al.*, 2002) was prepared which provided a suite of draft criteria. The paper was endorsed by the Review of Marine Nature Conservation Working Group for the purpose of trialling on the Irish Sea as part of the Pilot.
230. From the foregoing, the Pilot identified the following main tasks:
- i. to formulate a clear rationale and justification for the selection of a network of nationally-important areas, applicable at the Regional Sea scale;
 - ii. to test out the draft criteria for the selection of nationally-important areas on the Irish Sea;
 - iii. to investigate, as necessary, the use of additional methodologies to create a network of nationally-important areas to support the practical conservation of marine landscapes, habitats and species.

The concept of networks of nationally-important areas

231. Marine species are a combination of highly mobile pelagic species (pelagic invertebrates, fish, seabirds, sea mammals, etc) characteristically capable of moving sometimes hundreds of kilometres in a year, either under their own power or as a consequence of currents or wind, and also of seabed species which normally have a mobile larval/immature phase. The relative mobility of this larval/immature phase is dependent on species and circumstances (currents, etc), but such species often have the ability to travel several tens of kilometres before they metamorphose and settle on the seabed. Since, the biological component of seabed habitats is comprised of seabed species, seabed communities have the same mobility capability, though the ability of habitats to develop fully in new areas depends on the suitability of substrate, depth, temperature, etc, and the relative mobility of the constituent species.
232. Because of this mobility, marine species and communities occurring in one sea area have the potential to move to, or colonise, adjacent, and sometimes quite distant, areas of sea. A network

of mutually-supporting areas, or areas capable of supporting the biodiversity of a neighbouring sea or seabed area, is, therefore, a practical ecological proposition.

233. As part of its work, the Pilot commissioned a review of current information and thinking on ecologically-coherent networks of important areas from the Environment Department of the University of York. The report of this work is available (Roberts *et al.*, 2003).
234. The main principles in the development of important area networks, as set out in the contract report, can be summarised as follows:
- i. networks should be designed to ensure that areas are mutually supporting (i.e. populations of animals and plants in one area should be capable of supporting, and be supported by, populations in other areas);
 - ii. networks should seek to incorporate the full spectrum of biological diversity (not just that subset which relates *inter alia* to rarity, endangerment, or other pre-selected importance values);
 - iii. examples of habitats (or concentrations of species) should be replicated in separate areas;
 - iv. the total area of the network, and its distribution in terms of individual component areas, should be capable of meeting the objective of sustaining species and their habitats in perpetuity;
 - v. the best available information should be used in site selection, but the development of the network should not be delayed pending action to collect further information.

These principles have largely been adapted from those proposed by Ballantine (1999).

235. Paragraphs 236-242 below elaborate these principles somewhat, on the basis of current thinking.

The principle that sites within a network should be mutually supporting

236. Because of the inherent mobility of marine species and communities, genetic exchange between sites can take place, and a species lost from a given site may be replaced by colonists from another. This potential for mutual support needs to be considered at the time of area selection, although, because water movements are so extensive and variable, detailed knowledge of dispersal patterns along them is not essential. Consideration of biogeography, and of the general layout of water masses, would generally be sufficient. Furthermore, highly mobile or migratory species may be able to utilise a range of areas for feeding or breeding at different times. Because of this mobility, a network of sites can be capable of accommodating and adjusting to dynamic and other environmental changes, such as climate change.

Network design should incorporate the full spectrum of biological diversity

237. The purpose of this principle is to ensure that the areas selected reflect the full range of marine biodiversity present in the country, not just those elements identified through the application of pre-determined values such as rarity (though not excluding these). This is a strategic approach to maintaining the full range of national and regional biodiversity over time as opposed to taking action only when a habitat or species has become threatened, an approach which will almost certainly result in progressively smaller species populations and areas of habitat. Levels of protection afforded to the areas selected need to be capable of sustaining the range of biodiversity naturally characteristic of the area, and not confined to pre-selected elements. This is to avoid human activity suppressing or eliminating some elements of biodiversity, with the result that the area does not reach its full potential.

Area replication

238. The purpose of area replication is to insure against the risk of individual areas being damaged, and their biological components being reduced or lost, as a result of a damaging natural occurrence or human activity. Several examples of the same area type are, therefore, selected in an effort to avoid this. Replicate areas should, ideally, be separated from each other sufficiently to ensure that an impact which damages one area does not also damage the others. However, the replicate areas should not be located so far apart that organisms from an undamaged area cannot re-colonise and restore a damaged one.

Extent of area

239. As on land, the general principle that large areas are preferable to small ones applies to the marine environment, but, also as on land, examples of some types of habitat (e.g. some reef systems or gas seep structures) may be sufficiently protected at fairly modest scales (e.g. 5km²), having due regard also to the practicalities of regulating potential adverse human impacts. Clearly, if the occurrence of a particular habitat-type is itself limited, this will constrain the size of the area selected. For habitat types which depend for their structure and function on processes potentially operating over extensive areas (e.g. shallow subtidal sandbanks), significantly more extensive areas (e.g. 1,000-5,000km²) may be needed.

240. As regards the total extent of a network, this will depend on a) the degree of variability of the habitat (i.e. a high level of variability is likely to lead to a requirement for a larger number of areas), and b) the degree to which the sea or seabed outside the network is likely to be adversely affected by human activities (i.e. the greater the level of impact outside the network, the greater the proportion included within the network needs to be). As a guide, a body of experience appears to be emerging which suggests that 10-15% of the marine area should be included within important area networks. Where a habitat type is limited in extent, the proportion should be higher (perhaps 30-40% and, in cases of habitat rarity, in excess of this). Conversely, if the habitat is widespread and relatively uniform, the proportion could be lower (perhaps 7-10%). These figures do not incorporate consideration of the area required to support mobile, commercially-exploited fish species.

Use of most appropriate information

241. Where detailed biological information exists, it should be utilised in area selection. Indeed, as regards identifying concentrations and aggregations of mobile species such as seabirds and sea mammals, the availability of adequate biological data is essential. However, for the purposes of identifying a representative series of habitat types within a network, techniques have been developed which do not require such detailed biological information. For these, a lesser level of information could be acceptable, for instance the level of information used to define and validate marine landscapes.

242. The density of selected areas for benthic or demersal features as part of a network, and thus the distance between them, will be dependent on the state of the seabed in between. Characteristically, although some seabed species are capable of being transported up to some tens of kilometres (or further, exceptionally) in their larval phase, much settlement actually occurs quite close to the site where the parents occur. This allows 'seeding' into the adjacent localities, and potentially enables these localities and the areas within the network to provide mutual support. The less intensively the adjacent sea is impacted by human activities, therefore, the lower the density of areas within the network needs to be and probably also the smaller the overall extent of the network.

Discussion

243. An ecologically-coherent network is likely to contain the following elements:
- i. representative examples of all the broad marine habitat types;
 - ii. areas of exceptional habitat or species biodiversity;
 - iii. important areas for aggregations of mobile species, (e.g. important spawning, nursery, calving, feeding or resting areas, and migration bottlenecks).
244. Separate networks should be developed for each of the main biogeographical regions. For example a network including all the elements described in paragraph 243 above should be selected for each 'Regional Sea'. This is because the biological characteristics of each of these Regional Seas will be significantly different from the others.
245. In the creation of a network, it is often possible to consider a number of potential areas before selecting a representative example of a habitat. Where this is the case, other considerations (e.g. low threat likelihood, contribution to sustainable fisheries, recreational and research potential) can all be considered in area selection. Sites which have already been selected for protection (e.g. under the EC Birds and Habitats Directives) could be expected to be selected for inclusion within the network in preference to other, similar, areas. Sustainable development necessitates involving sectoral interests and local communities in area selection. For example, fishing interests may be able to identify areas where the provision of additional protection would support their interests.

Testing the Draft Criteria

246. The draft criteria for the identification of nationally-important marine areas were given in Connor *et al.* (2002) as:

- 1. Typicalness:** the area contains examples of marine landscapes, habitats and ecological processes or other natural characteristics that are typical of their type in their natural state.
- 2. Naturalness:** the area has a high degree of naturalness, resulting from the lack of human-induced disturbance or degradation; marine landscapes, habitats and populations of species are in a near-natural state. This is reflected in the structure and function of the features being in a near-natural state to help maintain full ecosystem functioning.
- 3. Size:** the area holds large examples of particular marine landscapes and habitats or extensive populations of highly mobile species. The greater the extent the more the integrity of the feature can be maintained and the higher the biodiversity it is likely to support.
- 4. Biological diversity:** the area has a naturally high variety of habitats or species (compared to other similar areas).
- 5. Critical area:** the area is critical for part of the life cycle (such as breeding, nursery grounds/ area for juveniles, feeding, migration, resting) of a mobile species.
- 6. Area important for a nationally-important marine feature:** Features that qualify as special features or which are declined or threatened should contribute to the identification of these areas. The assessment should consider whether such features are present in sufficient numbers (species), extent (habitat) or quality (habitats, marine landscapes) to contribute to the conservation of the feature.

The purpose of trialling the draft criteria was to determine whether they were fully satisfactory, and to develop methodologies for applying them in practice.

Methods

247. The initial approach adopted in applying the criteria was to apply them to areas within individual marine landscape types in turn. If the criteria proved effective this should result in the identification of areas containing 'best examples' for each marine landscape type. The overall series of areas identified would encompass the full range of marine landscapes, and, assuming that marine landscapes may be used as a surrogate unit for other components of the marine ecosystem (e.g. species, habitats), it would ensure a full representation of marine biodiversity. In order to test the effectiveness of the draft criteria, two marine landscape types were selected for trialling this approach, namely 'Estuaries' and 'Coarse Sediment Plains'. The Estuaries marine landscape type was selected as an example of the 'coastal' group of marine landscapes. In this group the boundaries of sites within this landscape type are clearly defined, and, being coastal in nature, biological data are relatively plentiful. The Coarse Sediment Plains¹ marine landscape type was selected as an example of the 'seabed' group of marine landscapes; boundaries of these landscape types are often broadly-defined, and being largely offshore in occurrence, biological data relating to them are often sparse.
248. With reference to the individual draft criteria, 'typicalness' was assessed by a range of methods including identifying the characterising biotope complexes for the marine landscape and selecting specific examples of the marine landscape to encompass the range of biological character. Examples of marine landscapes were rated for 'naturalness' by ranking them in relation to the relative absence of human-induced disturbance or degradation. 'Size' was calculated from the GIS layer containing the marine landscape polygons. Biological diversity was determined using the Banded Ranked Relative Richness method described in Connor & Hill (1998), which ranks the areas according to the number of species (or biotopes, or biotope complexes) recorded in each, and then splits the ranks into 5 bands of equal width. The highest ranking areas receive a BRRR score of 5, the lowest ones a score of 1. Information used for the assessment came from a variety of sources; the benthic data were from the JNCC marine habitats database and from the Irish Sea Seabed Image Archive (ISSIA) (Allen & Rees, 1999).
249. For 'Critical area', a determination was made as to whether the site overlapped with a Special Protection Area designated for its seabird or intertidal waterbird populations (the same approach could be used in relation to 'marine species' Special Areas of Conservation and to important fish sites, but this was not done as part of the test). Finally, the 'Area important for nationally-important marine feature' criterion was applied to the extent of identifying the numbers of habitats and species recorded for each Estuary which were on the Irish Sea provisional list; however, this criterion was also considered separately for the Irish Sea as a whole.
250. Because their boundaries were defined, it was easy to identify a range of estuaries against which to test the criteria. A set of 28 estuaries, all in the UK, were included in the test. An attempt was made to carry out a similar test for the Coarse Sediment Plains, which occur as large continuous areas of seabed. A 10km by 10km grid was used to produce a series of grid cells that could be compared using the methods outlined above.

Results

251. The results of applying the criteria to 28 Irish Sea estuaries is summarised in Table 7, which provides an overview of the rankings allocated against each of the estuaries for each of the criteria.

¹Coarse Sediment Plains were subsequently separated into two types in the Marine Landscapes classification, namely Low bed-stress Sediment Plains and High bed-stress Sediment Plains, but in the criteria test these types were combined.

Table 7. Overview of rankings allocated to each estuary for each criterion.

The order of estuaries in this table is not significant, i.e. no overall ranking of estuaries is suggested.

Abbreviations: Typicalness: **C, D** and **E** refer to Water Framework Directive types following Rogers *et al.* (2003); **G** to general estuaries marine landscape; * refers to additional areas required to represent the range of estuarine complexes fully. For the ranking scores, 5 is the highest score against the relevant criterion in each case. **Y** refers to estuaries which are SPA for seabirds or intertidal waterbirds, **y*** denotes estuaries which only partly overlap with an SPA. The figures shown in the 'Area important etc' column are numbers of habitats and species on the nationally-important provisional list recorded from the estuary.

Estuary	Diversity of biotope complexes	Diversity - biotopes	Diversity - species	Typicalness	Naturalness	Size	Critical area – birds (SPA)	Area important for nationally important habitat or species
Water of Fleet	4	4	4		5	3		4
Afon Teifi	5	5	5	C; G	4	3		3
Malltraeth Sands (Afon Cefni)	3	2	2		5	3		2
Rivers Esk, Mite & Ir	5	5	5	E; G	4.7	2		6
Mochras Lagoon (Artro estuary)	2	2	3		3.7	2		3
River Dee	4	4	4		2	5	y	3
Cree & Bladnoch estuaries	3	3	3		4	5		1
River Lune	3	3	3		3	3	y*	2
Afon Nyfer	4	4	4	C; G		2		0
Duddon Sands	5	5	4		2.7	4	y	3
Solway Firth	5	5	5	*	3.3	5	y	10
Clyde estuary	1	1	3		1.3	4		1
River Leven	3	3	2		3	4	y*	1
Cresswell & Carew Rivers	3	3	5	*		2		4
Afon Mawddach	5	5	5	C; G	4.7	3		4
Afon Dyfi (River Dovey)	4	4	4		4.3	4	y	2
Nefern estuary	1	1	1			1		0
Ffraw estuary	1	1	1			1		0
Traeth Bach (Glaslyn & Dwryrd)	4	4	4		4.3	4		2
Pilanton Burn & Water of Luce	1	1	1		4.3	2	y*	0
W & E Cleddau	2	2	3	*	4.5	3		2
River Ribble	3	3	3	E	2.3	5	y	3
Afon Reidol & Ystwyth	2	2	2		2.7	1		0
River Kent	3	2	2		3	4	y*	1
Afon Dysynni (Broad Water)	2	2	2			2		1
Aeron estuary	1	1	1			1		0
Dwyfor estuary	1	1	1			1		1
River Mersey, inc. Alt	2	2	2	D	2	5	y	2

252. Table 7 provides an overview from which conclusions on those estuaries which would qualify as being nationally-important can be made by applying the following method:

- i. include those examples which support the highest biodiversity;
- ii. include sufficient examples to represent fully the biotope complexes characteristic of the marine landscape feature;

- iii. check examples are acceptably natural and are appropriate in size.

As a result of difficulties encountered trying to apply the 'Critical area', and 'Area important for nationally-important marine feature' criteria to individual marine landscapes, it was concluded that these criteria are assessed better at the Regional Sea scale, as these criteria are, to some extent, independent of the individual marine landscape types.

253. The thresholds for selection remain a matter for discussion and consideration. It should be noted that it may not be simply a matter of selecting the highest scoring estuaries since there may be a need also to include certain lower-scoring estuaries within the network to encompass the full range of ecological variation. Nonetheless, once thresholds for 'national importance' are set, it will be appreciated that they will be able to be used with confidence when the criteria are applied to estuaries independently of the national/regional/local context providing that natural differences resulting from biogeographical variation are also taken into account.
254. For the Coarse Sediment Plains, it was found that most of the 10km x 10km grid cells selected contained few or no data records. Applying the criteria to such a site series could yield no meaningful results and the methodology proved impractical. The inevitable conclusion has to be that, at the moment, the criteria cannot be applied with confidence to the majority of marine landscape types which occur primarily in non-coastal situations using the methods as described for 'Estuaries'.

Discussion

255. The draft criteria could be applied successfully for the identification of nationally-important areas for marine landscape types for which there are sufficient data available. Data coverage is relatively good in coastal areas, both in terms of records on the JNCC marine database and in terms of additional published information and the grey literature. The marine landscape types falling into these areas are principally Estuaries, Rias, Saline Lagoons, Sea Lochs and Sounds. The application of the criteria to these marine landscapes is facilitated by the fact that they have fairly clearly-defined natural boundaries, i.e. they fall into discrete spatial units which can be compared. Examples of some types of the more offshore seabed marine landscapes may also be naturally well defined, for example Gas Structures, Sea Mounds and, potentially, Photic and Aphotic Reefs, and Deep-water Channels. However, the criteria could only be applied successfully to these marine landscape types if sufficient data were available.
256. Sediment-dominated marine landscape types are generally too large or continuous to allow comparison between examples using natural boundaries. If sites are defined by a grid-cell system, however, the size criterion is of limited use, though clustering of high-scoring adjacent grid cells could be taken into account. However, the main problem for these areas is the scarcity of data, which, at the moment, prevents the criteria from being applied effectively to offshore marine landscapes.
257. The approach of applying the criteria to each marine landscape type in turn will, therefore, only go part of the way to identifying a full suite of nationally-important areas within a Regional Sea. Where sufficient information is available, the first four criteria (naturalness, typicalness, biodiversity and size) can be applied to individual marine landscape types in turn. However, applying the last two criteria ('critical area' and 'important areas') as part of the process of identifying representative examples of the main habitat types proved more problematic. It was concluded that:
 - i. in relation to selecting representative examples of main habitat types, criteria 1-4 of paragraph 246 could be employed in situations where these habitat types occurred as relatively discrete, naturally-defined, areas and potentially for other types using a grid cell system, for which there are sufficient biological data;

- ii. criteria 5 and 6 of paragraph 246 are best applied separately at the Regional Sea scale;
- iii. alternative methodologies are needed to select representative examples of the main habitat types when biological data are scarce.

258. Additional methodologies to address the needs of points ii. and iii. above were investigated as part of the Pilot and are reported below.

Additional methodologies for creating a network of nationally-important areas

Critical areas in the life cycle of mobile species

259. Work to identify nationally and internationally-important localities for intertidal non-breeding waterfowl populations, and also for seabird breeding colonies, has been ongoing for many years, and guidelines for the selection of these as Sites of Special Scientific Interest in Great Britain, and as Special Protection Areas in the United Kingdom, have been published respectively by the Nature Conservancy Council (1989) and the Joint Nature Conservation Committee (1999). Detailed population figures for all major sites in the United Kingdom, including intertidal areas, are provided annually through the Wetland Bird Survey (Pollitt *et al.*, 2003). A similar scheme (I-WeBS) is operated in the Republic of Ireland. A census of most of the important seabird colonies in Britain and Ireland was undertaken between 1999-2002 and the results will be published during 2004.
260. Work to identify important marine resting and feeding sites for assemblages of seabirds (including seaduck, divers and grebes) as a component of the UK network of Special Protection Areas is currently being undertaken by JNCC and the country nature conservation agencies. Methods are based on the statistical analysis of recorded seabird densities in conjunction with the published SPA selection guidelines (Joint Nature Conservation Committee, 1999). To date, sites have been selected for black scoter at Carmarthen Bay (just outside the Pilot area), and are being considered for black scoter and red-throated diver at Liverpool Bay.
261. Guidelines for the identification of important areas for seals have been published by the Nature Conservancy Council (1989) for Sites of Special Scientific Interest, and by the Joint Nature Conservation Committee (McLeod *et al.*, 2002), for Special Areas of Conservation. Data on the distribution of cetaceans in British and Irish waters has been compiled and the results published (Reid *et al.*, 2003). A statistical approach is being taken to investigate the appropriateness of selecting Special Areas of Conservation for harbour porpoise.
262. Records of basking shark occurrence have been collated and the results are shown in Map 17. The data indicate concentrations of sharks around the southern and western coasts of the Isle of Man, in the Clyde Sea particularly around the coasts of the Isle of Arran, and, locally, off other coasts in the northern part of the Irish Sea area. While this distribution certainly demonstrates the occurrence of basking sharks in these waters, at least in summer, the data are also likely to reflect, to some extent, the relative intensity of recorder effort. From the Solway Shark Watch, basking sharks are also known to use the Solway Firth and waters off the Cumbrian coast and Morecambe Bay, but those data have not been contributed to the Pilot database. At this juncture, it is difficult to conclude whether including areas for this species within an area network would be of material conservation benefit to the species.
263. Areas considered to be important spawning and nursery areas for commercial fish species were combined and are shown in Map 18. However, the relatively widespread nature of areas critical for one or two mobile species raises the potential problem of attaching the 'nationally-important' label to large areas of sea. This could result in protection being extended over large areas but resulting in few conservation benefits. It may be better to use integrated regional sea-scale management approaches to avoid the destruction of large spawning and nursery areas, and to

prevent the decline of mobile species, unless such areas are critical for the survival of a number of mobile species, or host very dense aggregations of a mobile species.

Important areas for nationally-important benthic species and habitats

264. Map 19 shows the number of benthic species which occur in each 5km by 5km grid cell within the Irish Sea. Map 20 uses the same grid cell system to show the number of benthic habitats and species on the provisional list of nationally-important features. The overall pattern of distribution and density between these two maps is similar. Areas where high numbers of nationally-important marine features are recorded could qualify under this criterion. On the basis of available data, those grid cells showing the highest diversity of nationally-important features do represent real biodiversity 'hotspots'. What cannot be asserted, because of the scarcity of data, is that similar 'hotspots' do not also occur offshore. However, a conservation strategy has to have full regard to the data which are available, and Map 20 indicates such hotspots along the coasts of Dyfed, Lleyn Peninsula, Anglesey and the Menai Straits, southern Isle of Man, northern Clyde Sea, Strangford Lough and adjacent coasts of Co. Down, and Co. Waterford.

High diversity marine landscape areas

265. It is apparent from the map of coastal and seabed marine landscapes (Map 12), that areas of the Irish Sea differ in their variety of marine landscapes. Some areas are relatively uniform, with one or two marine landscapes, in others many more types of marine landscape are to be found. The grid cell system was used to compare the relative diversity of marine landscape areas, and the results are shown in Map 21. Areas of high marine landscape diversity can be used to identify probable areas of high biodiversity where biological data are scarce, and this approach could be used to identify probable diversity hotspots in such areas. Map 21 indicates areas of high marine landscape diversity off the coasts of Co. Antrim and Co. Down and eastwards to the Mull of Galloway, off Anglesey, off the coasts of Co. Wexford, Co. Waterford and Dyfed.

The use of the software tool Marxan in identifying a suite of nationally-important areas

266. Applying the first four criteria to data-rich inshore marine landscape types, and identifying areas qualifying under the last two criteria based on best available information, will result in a set of areas identified as nationally-important. However, it will not ensure that the full range of marine biodiversity is represented within those sites - additional areas need to be selected for the data-poor marine landscapes. Furthermore, it will not take into consideration ecological network principles such as those outlined in paragraphs 236-242. Additional areas are needed to develop an ecologically-coherent network, taking into account those areas already identified as nationally-important.

267. The use of the software tool Marxan (Ball & Possingham, 2003) was investigated to address the issue of prioritising areas at the Regional Sea scale. The Marxan process starts by dividing the Regional Sea into small (planning) units. Targets are set for conservation features, and Marxan identifies sets of planning units with which those targets can be met (e.g. it can be instructed to select units sufficient to contain 3 records of each nationally-important benthic species and a specified % of the total area of each marine landscape). Each planning unit has a cost (in the simplest case, a measure of its size), and Marxan finds the cheapest 'networks' of planning units in which the targets are met. The process can be constrained in a number of ways to take a range of factors into consideration, for example:

- i. different targets can be set for any number of conservation features, or for any measurable spatial unit, e.g. targets could be set to represent a given percentage of known nursery or feeding grounds of mobile species;
- ii. a boundary length modifier can be used to minimise the overall boundary length of the selected 'network' of planning units, in order, for example, to avoid the programme selecting

highly scattered sets of planning units;

- iii. it is possible to increase the relative costliness of planning units if they are in areas of intense human activity (therefore less natural); to lock areas into the process (e.g. estuaries already identified as nationally-important, existing protected areas (such as those indicated on Map 22), biodiversity hotspots etc), and to lock areas out of the process (e.g. areas known to be unsuitable for the potential location of future marine protected areas due to current or planned human activity).

There is no limit to the number of data layers that can be incorporated into the process: any spatial data in GIS format can be used. A number of scenarios were run for the Irish Sea Pilot, using different combinations of datasets and constraints.

268. Marxan yields two types of maps as a result of running each scenario. The algorithm it uses includes a random element, which means that each time the same scenario is run, the answer will be slightly different. By running the same scenario many times, it is possible to work out the percentage of runs in which each planning unit was picked, resulting in a value of 'irreplaceability' for each planning unit. In addition, the 'best solution' map shows the solution with the lowest total cost. It is important to look at both in conjunction. The 'irreplaceability' map shows the relative importance of areas for meeting the targets, and allows for prioritisation between areas. The 'best solution' map gives a clear indication of the amount of area necessary for meeting the targets. Map 23 and Map 24 show the results of running the scenario where the cost of planning units was scaled according to naturalness, and where high biodiversity areas and existing SPAs and candidate SACs were locked in.
269. Note that the success of the recommended process for the identification of nationally-important marine areas depends on other pieces of work having been completed. Most notably, a map of marine landscapes is needed. Data on human activity have to be collated in GIS format to be able to take naturalness into consideration as a factor. Targets for features such as marine landscapes, species and habitats within the selected areas have to be set bearing in mind the limitations of the data on the distribution and abundance of these features. The outcome of using the Marxan software tool is dependent on the quality of the data that it is provided with - it cannot solve problems relating to data quality, coverage and uneven sample distribution. Expert judgement will always be needed to determine why some areas show up as more important than others, and to some extent this will depend on the available data which were incorporated at the outset. Problems of missing and uneven data will be present whichever way the criteria are applied. However, Marxan has a number of advantages over other approaches:
 - i. it provides a step in the process of applying the criteria which looks at many factors simultaneously, areas are not identified independently from each other - they are selected to complement each other;
 - ii. it ensures efficient, full representation of known biodiversity;
 - iii. it allows the inclusion of areas already identified as nationally-important;
 - iv. while Marxan cannot apply the criteria directly (it does not measure biodiversity or naturalness), it allows incorporation of the criteria in the area identification process;
 - v. the software is flexible and can be run on any number of different scenarios, this enables an interactive process of identifying nationally-important areas;
 - vi. the outcome of Marxan is still open for interpretation - there is no need to let the software 'dictate' the location of nationally-important areas. However, the irreplaceability maps are extremely useful to allow prioritisation between areas.

Discussion

270. It can be concluded that the draft criteria (Connor *et al.*, 2002) are basically sound, with the proviso that the 'critical area' criterion should not result in large areas being identified for the purpose of conserving one or two mobile species unless the area hosts dense aggregations of such species. A variety of methods will need to be employed when applying these criteria, depending on the availability of the data and the mobility of species. A minor modification to one of the criteria is suggested, namely to criterion 5 (critical area for part of the life cycle of a mobile species) where it is recommended that the relative scarcity of such areas is taken into account. The revised guidance is provided at Appendix 5.
271. An ecologically-coherent network of important areas, with attention given to the location of areas within the network to enable them to carry out their mutually-supporting function most effectively, will be a crucial conservation tool and one which is capable of contributing to the economy including through support to tourism and sustainable fisheries.
272. Such an ecologically-coherent network will contain some areas which have been identified so as to support specific aspects of biodiversity, together with areas which have been selected to contribute to the range of biodiversity elements characteristic of a particular sea area. It is fundamental to this concept that areas, once identified, should receive appropriate protection from the effects of human activities. These issues are discussed further in Chapter 12.
273. A necessary development in the use of the Marxan tool is to consider further, and obtain consensus on, the targets selected for the various components of biodiversity contributing to the area network. This is a key issue for further work.

Recommendations

274. The recommended process for identifying nationally-important marine areas at the regional sea scale can be represented as follows:

R19 An ecologically-coherent network of nationally-important areas for the Regional Sea should be identified using the criteria set out in Appendix 5, and the principles set out in this Report. Proportionate and relevant measures should be taken to protect these areas from harm as a result of human activities.

R20 In the selection of nationally-important areas, for those marine landscapes where there are sufficient data available, representativity and biodiversity criteria should be applied and 'best examples' identified. Using best available information, areas qualifying under critical area or nationally-important features criteria should be identified as far as possible.

R21 For data-poor (normally offshore) areas, GIS data should be collated to allow a broadscale scoring of areas against the naturalness and biodiversity criteria. A marine landscape classification is necessary to use as a surrogate for more detailed ecological data. Marxan can then be used to complete the identification of a full set of nationally-important areas within the Regional Sea. This process should take into consideration best available information on naturalness and typicalness, the distribution of records of nationally-important marine features, patterns of biological diversity, and the distribution of marine landscapes.

275. A full report of the work carried out on the nationally-important areas is available in Lieberknecht *et al.* (2004b) and online at www.jncc.gov.uk/irishseapilot.

10. NATIONALLY-IMPORTANT MARINE EARTH HERITAGE AREAS

276. The Review of Marine Nature Conservation Working Group requested that the Pilot investigate the rationale for Earth heritage conservation in the marine environment, and to recommend the most appropriate means of conserving nationally-important marine geological and geomorphological sites.
277. In the terrestrial environment the purposes of conserving geological and geomorphological sites are considered to be:
- i. to conserve sites which are the international type examples of an important aspect of geology, and which, therefore, underpin geological science globally;
 - ii. to conserve the most important aspects of a country's Earth science heritage for future generations;
 - iii. to provide a resource for education, training and research in the Earth sciences;
 - iv. to conserve a cultural and recreational resource;
 - v. to support environmental forecasting by enabling the study of natural processes as they have operated in the past and as they continue to operate today.
278. The approach taken in the selection of terrestrial Earth science sites in the UK is explained in Ellis *et al.* (1996) for Great Britain and Enlander (2001) for Northern Ireland. There are three main components to the series of nationally-important Earth science sites, namely:
- i. sites of international importance;
 - ii. sites having unique, rare or exceptional features;
 - iii. sites representative of an important aspect of the country's earth science heritage.
279. In selecting a series of representative sites for Great Britain, the country's Earth science heritage was subdivided into 100 'blocks' (selection categories) covering various aspects of stratigraphy, palaeontology, Quaternary geology, geomorphology, igneous petrology, structural and metamorphic geology, and mineralogy. For each block, one or more networks of sites were identified in order to illustrate the range of important geological or geomorphological aspects of the block. In Great Britain some 3,000 individual sites were identified using this method, and the reasons for selection and descriptions of the sites are being published in some 40 volumes of the Geological Conservation Review (GCR).
280. Existing conserved terrestrial sites extend only down to low water mark. Little attention has, hitherto, been paid to Earth science features in the marine environment. There is as yet, no rationale for the conservation of Earth science features below low water mark, and the marine Earth science site information that exists remains dispersed and disparate.
281. Consideration of the purposes identified under paragraph 277 above for terrestrial sites in terms of their applicability to the marine environment leads to a number of preliminary conclusions. Firstly, to date, marine sites have contributed relatively little to the global understanding of Earth science because they have been only researched only in a very limited way. Secondly, the difficulty of access limits the use of marine sites for education, training and research. The same is true of the use of marine sites as a cultural or recreational resource, except through remote means such as television or video. Marine sites certainly will contain some elements of the country's earth heritage that are either not expressed on land, or are less well expressed on land (e.g. features

such as gas seeps, sand volcanoes, and iceberg plough marks); also marine sites have present and potential value for the conservation of present-day natural submarine of geomorphological processes, and of improving understanding of how such processes operated in the past.

282. The threats from human activities to marine geological and geomorphological features are largely confined to significant dredging and dumping activities and from engineering works. For most of these, effective present day controls exist but are not applied directly for Earth heritage conservation purposes because important sites have not been identified.
283. In order to develop a rationale for marine geological and geomorphological conservation, the Pilot commissioned the University of Wales, Bangor, to review this issue and to reach conclusions.

Conclusions of the review

284. The main conclusions from the review were as follows:

- i. the premise that there is a need to preserve our Earth heritage for future generations, and in doing so, maintain the resources necessary for continued and future research, applies to the marine environment as much as it does terrestrially;
- ii. any programme of marine Earth science conservation must be developed in parallel with, or be preceded by, an in-depth and wide-ranging data compilation exercise. This should include the use of the BGS offshore geological and geomorphological database currently being prepared by the Geophysics and Marine Geoscience group at BGS, Edinburgh;
- iii. the identification of a series of nationally-important Earth science sites should be carried out solely from the viewpoint of their Earth heritage and Earth science value, irrespective of the nature of the implementation measures subsequently taken to ensure their conservation;
- iv. because access to marine sites is inherently difficult, there is a need for data, information and materials relating to those sites to be made accessible;
- v. threats to marine Earth science sites can take a variety of forms e.g. dredging operations, changes to the water dynamics, spoil or sediment disposal, and engineering works of various kinds. A programme of marine Earth science conservation would need to be undertaken in close partnership with the relevant human activity sectors;
- vi. the method of using GCR blocks for site selection, as applied to terrestrial earth heritage conservation, is applicable to the marine environment, but a number of additional blocks covering marine geomorphology are likely to be needed;
- vii. where existing conserved geomorphological sites span the terrestrial, intertidal and marine environments, there is a strong case for extending the terrestrial sites to encompass the marine component of the site;
- viii. for non-geomorphology blocks, there is a possibility that sites occurring in the marine environment will fill in gaps in the existing site coverage. Because of the relative lack of knowledge about the significance of marine geological exposures, it is not possible to estimate the potential significance of this contribution at the present time;
- ix. in the selection of sites, numerical grading according to evaluation criteria is desirable to achieve transparency and objectivity in the site selection process. Sites could change their grading value over time as a result of new research or change in condition;

- x. sites which do not rely for their survival on the operation of marine processes can be conserved effectively by the regulation of human activity in the area in which they occur. For active geomorphological sites, there is a need also to secure the continuation of the marine processes which support them by exerting control over human activities also in adjacent areas.
- 285 Following receipt of these conclusions, the Pilot further commissioned the University to implement their recommendations in relation to the Irish Sea, and insofar as was possible, develop a list of nationally-important geological and geomorphological areas for the Irish Sea. The University tested out their conclusions on the Irish Sea, using data from various sources, including the British Geological Survey offshore regional reports, which summarise the offshore geology and geomorphology over the UK Continental Shelf, and also data available through the Internet Geoscience Data Index.
286. The method used was to try and identify areas in the following categories:
- i. nationally-important marine areas equivalent to the existing conserved terrestrial Earth science sites;
 - ii. where nationally-important areas are dependent on natural marine processes, both the areas themselves and wider zones within which the natural processes operate;
 - iii. areas which, irrespective of whether they contain GCR-equivalent sites, represent distinct characteristic submarine geological or geomorphological situations (these are called ‘Geotopes’).
- 287 For the identification and evaluation of possible areas, categories i) and ii) were taken together, and assessment in the context of the relevant existing GCR block or newly proposed thematic block. Geotope areas were identified in the context of five proposed categories namely: i) estuarine systems, ii) longshore systems, iii) island archipelago systems, iv) tidal strait systems, and v) shelf-slope systems.
- 288 Assessment was carried out on the basis of scoring the area against i) scientific value of the area, ii) threat status, iii) conservability; a scoring system was devised to ensure that the assessment was both objective and transparent. ‘Scientific value’ encompassed the qualities of overall importance, uniqueness/exceptionality, representativeness, existing and potential research status, educational value and historical interest. ‘Threat status’ was assessed on the basis of the likelihood of human activities damaging the area, either if undertaken on or close to it, or also if undertaken at a distance (e.g. by disrupting sediment supply to an active process site). ‘Conservability’ included an assessment of the relative intactness (or, conversely, degradation) of the area, the relative ease or difficulty of managing the site to retain its value, and the relative ability (or inability) of the site to repair itself, if damaged.
- 289 Candidate areas were identified from the available data. These were:

Existing GCR sites extending below low water

Luce Sands, Dumfries & Galloway	Newborough Warren, Anglesey
Solway Firth (North Shore),	Solfach, Gwynedd
Annandale & Eskdale, Dumfries	Porth Neigwl, Gwynedd
& Galloway	Morfa Harlech, Gwynedd
Cree, Dumfries & Galloway	Morfa Dyffryn, Gwynedd
Upper Solway, Cumbria	Ynyslas, Ceredigion
Walney Island, Cumbria	South Pembroke Cliffs, Pembrokeshire
Ainsdale, Merseyside	
Tywyn Aberffraw	

New marine areas

The Menai Strait	Pingo north west Anglesey
Sarn Badrig (and/or other sarnau), Cardigan Bay	Scour Mats main channel west of the Isle of Man
Southern Irish Sea Linear Troughs and Incisions	Roche Moutonnees west of Isle of Man
Muddy Hollow Holocene Deposits, Tremadoc Bay	Tidal Scour Cauldrons west of Anglesey
Morfa Dinlle	Periglacial Polygonal Patterned Ground north of Anglesey
Submerged Drumlins, Morecambe Bay	Canyon Formations Mull of Galloway
Gallows Point Hollow, Menai Strait	18 Gravel Reefs within Cardigan Bay
Cold Seeps, Muddy Hollow, Tremadoc Bay	2 Gravel Ridge/Patches North of Anglesey
Isle of Man Banner Banks	Inactive Tidal Sand Ridges west of South Wales Peninsula
Lune Deep, Morecambe Bay	Linear Sand Streaks on Smooth Gravel Beds, St Georges Channel
Large Mega-Ripples north of Holyhead	Giant Sand Waves within Cardigan Bay
Hard Rock Geology north west of Holyhead	Irish Sea Mounds, North western Irish Sea near main channel
Irish Sea Cold Seeps	
Moribund Tidal Sand Ridges northeast Isle of Man	

- 290 Applying the assessment method, and using the available information and data, candidate areas were identified, briefly described, evaluated, and a recommendation relating to each was formulated. The outcome of this work will be made available online at www.jncc.gov.uk/irishseapilot.
- 291 Areas selected as nationally-important Earth heritage areas by this process will fall into one or other of the following main groups:
- i. marine extensions of existing coastal geological or geomorphological protected sites;
 - ii. prospective geotopes adjacent to existing geological or geomorphological protected sites;
 - iii. prospective inshore, and also offshore, nationally-important geological or geomorphological areas, including those where the protection of supporting natural processes is required.
 - iv. prospective inshore, and also offshore, geotopes.
- 292 Identifying effective and appropriate means of ensuring the practical conservation of nationally-important areas identified through this process will need further consideration, but it is very probable that the conservation of those areas can be incorporated within the measures proposed for the conservation of marine landscapes (including strategic and spatial planning, and environmental assessment), and by measures taken to protect the network of nationally-important biodiversity areas. Indeed, areas which are nationally-important for their geology and geomorphology could simply be incorporated into the network of marine areas.

Recommendations

293. The following recommendations are made in relation to nationally-important marine earth heritage areas:

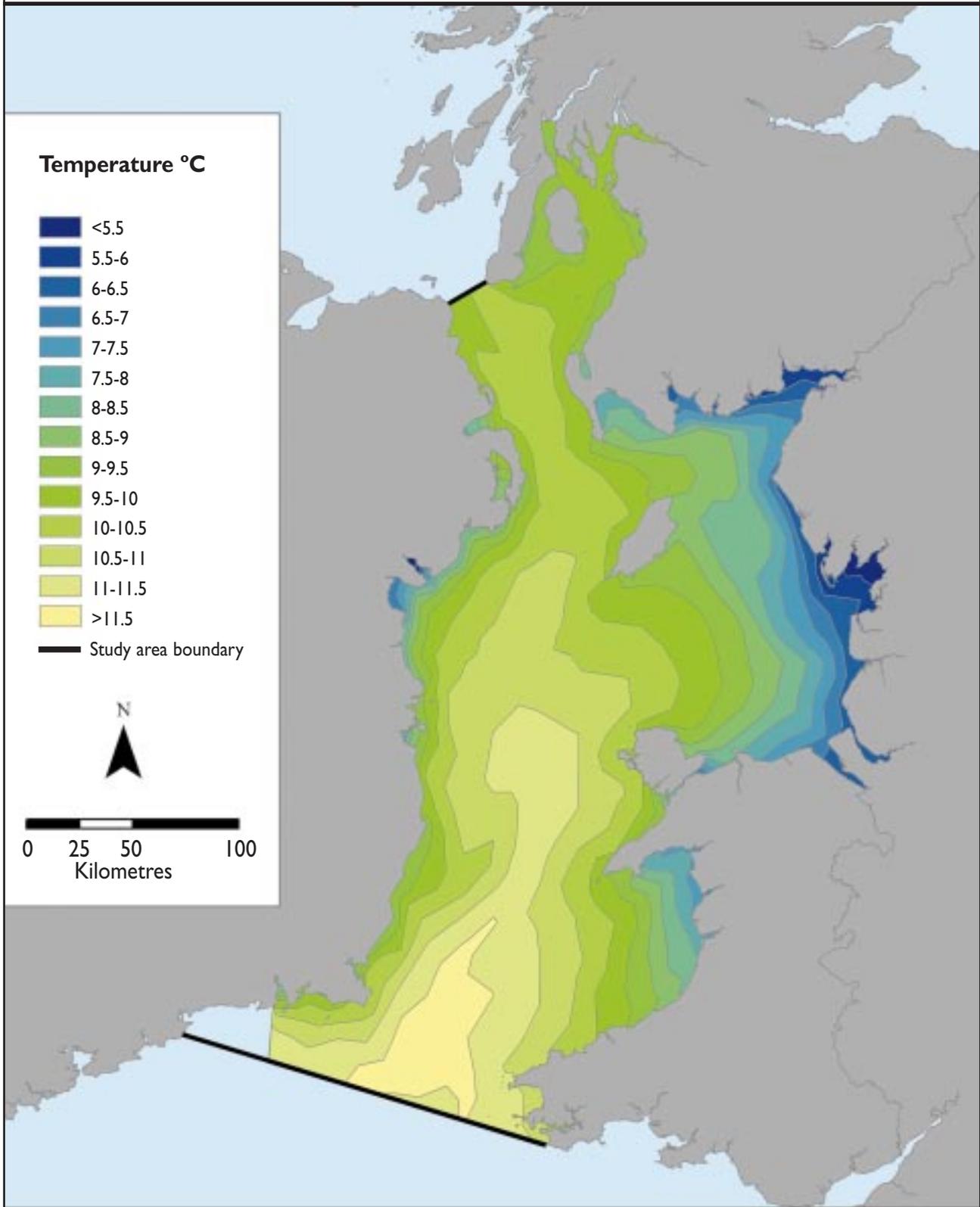
R22 Nationally-important areas for geology and geomorphology in the marine environment should be identified from present knowledge, and measures taken to conserve them which are proportionate and relevant to likely threats from human activities.

R23 To the extent practicable, conservation measures taken should be integrated with those taken for the conservation of biological diversity.

R24 Data, information and materials relating to nationally-important earth science sites should be made widely accessible.



Irish Sea Pilot Bottom temperature (Dec-Feb)

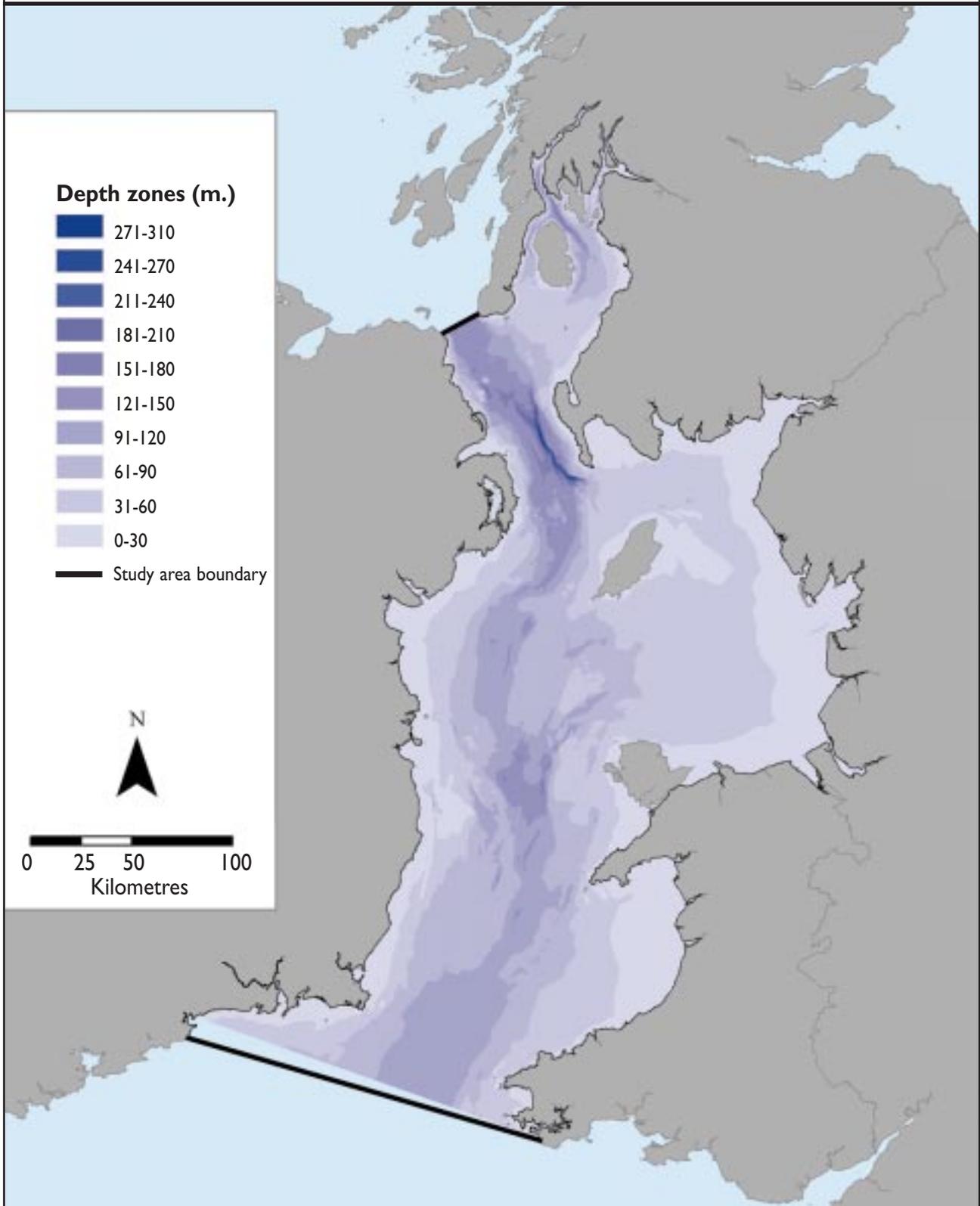


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Map version & date
Version 1 | 1/03/2003



Irish Sea Pilot Processed bathymetry



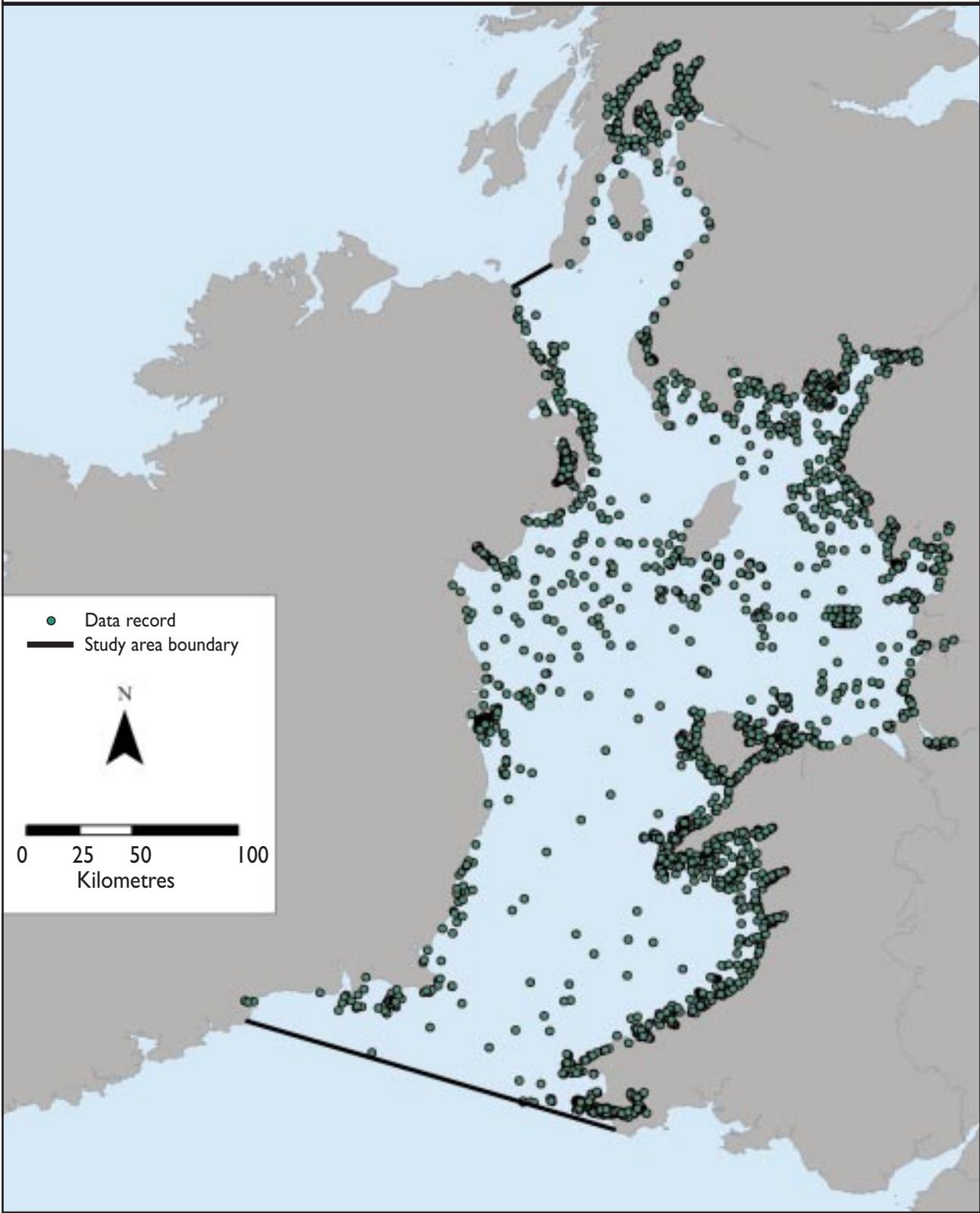
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Irish Sea Pilot

Biological data for Marine Landscape validation



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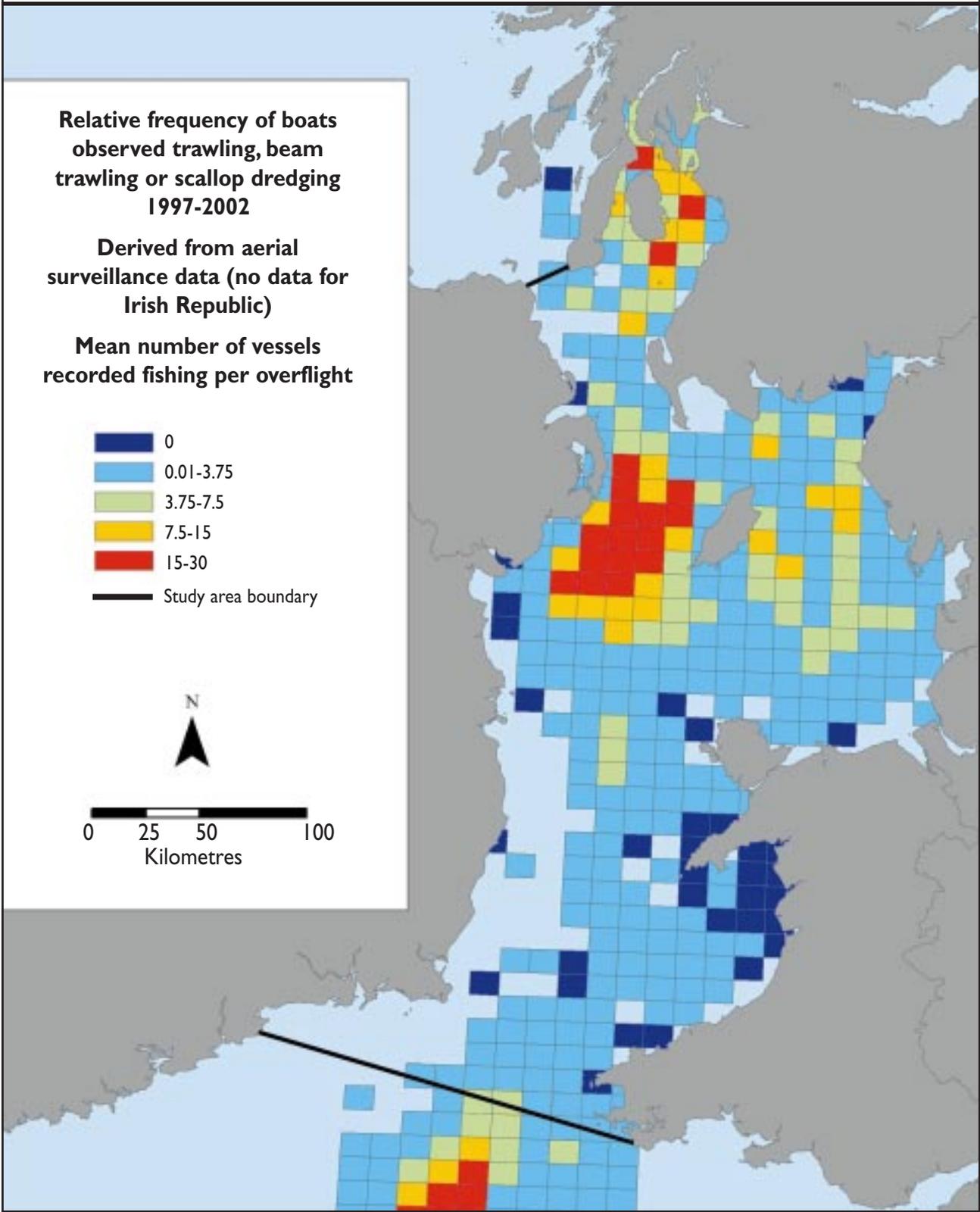
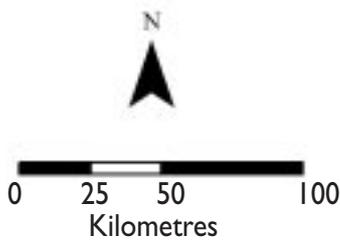
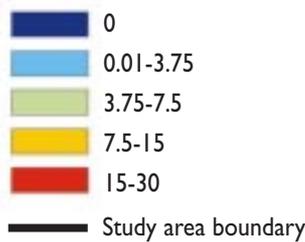
Irish Sea Pilot

Relative frequency of bottom-towed fishing gear use

Relative frequency of boats observed trawling, beam trawling or scallop dredging 1997-2002

Derived from aerial surveillance data (no data for Irish Republic)

Mean number of vessels recorded fishing per overflight

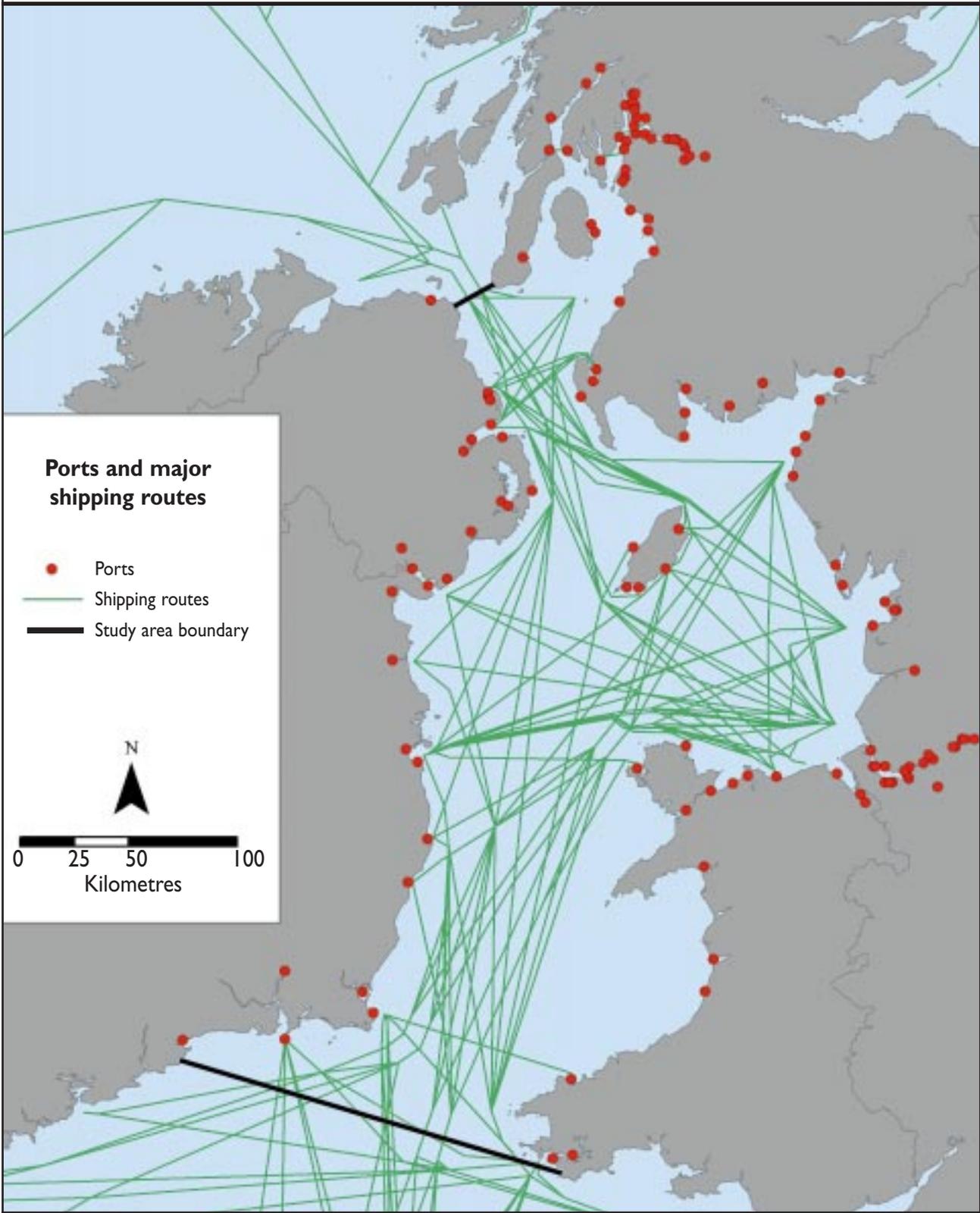


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Map version & date
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Irish Sea Pilot Ports and major shipping routes

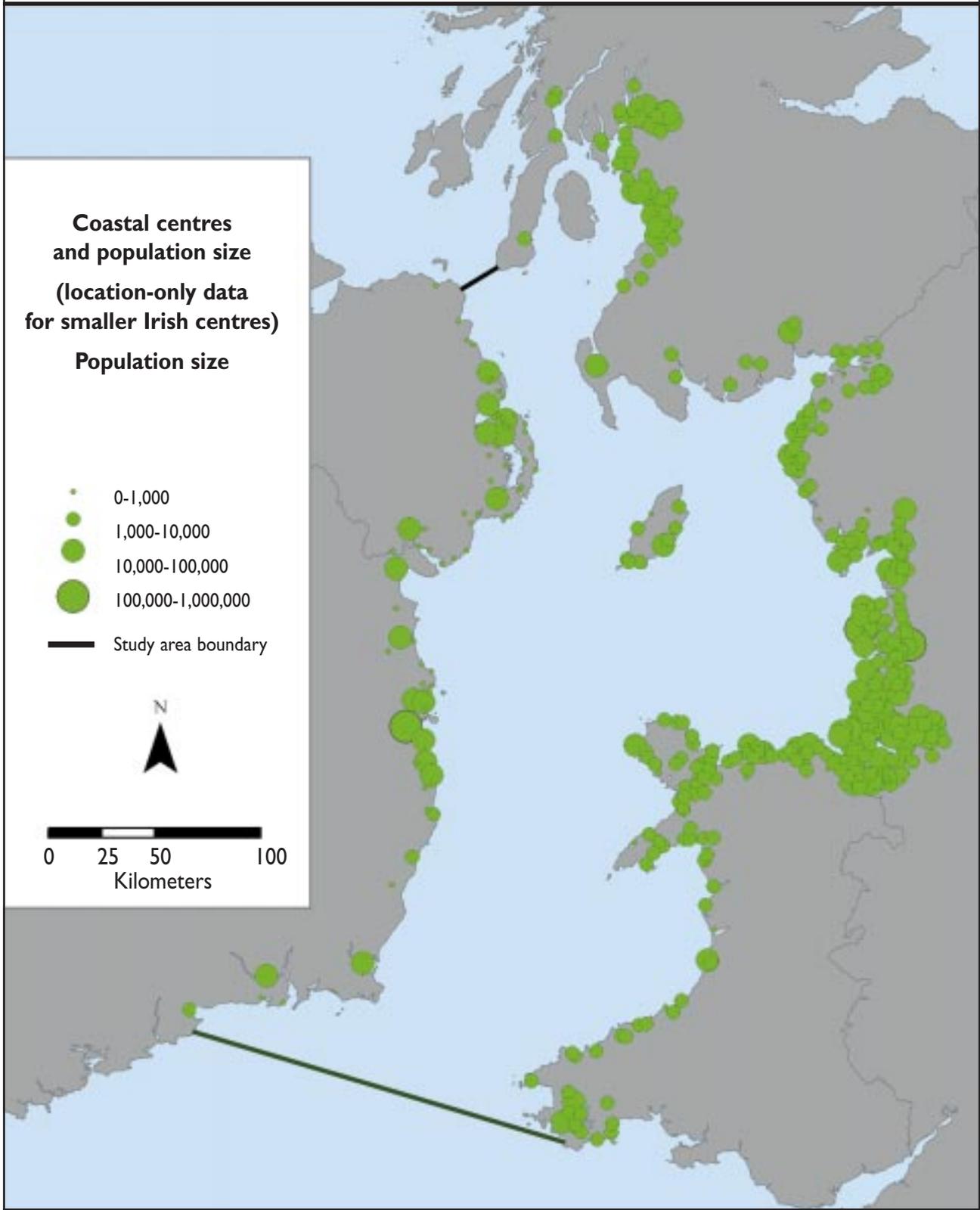


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Irish Sea Pilot Coastal centres and population size



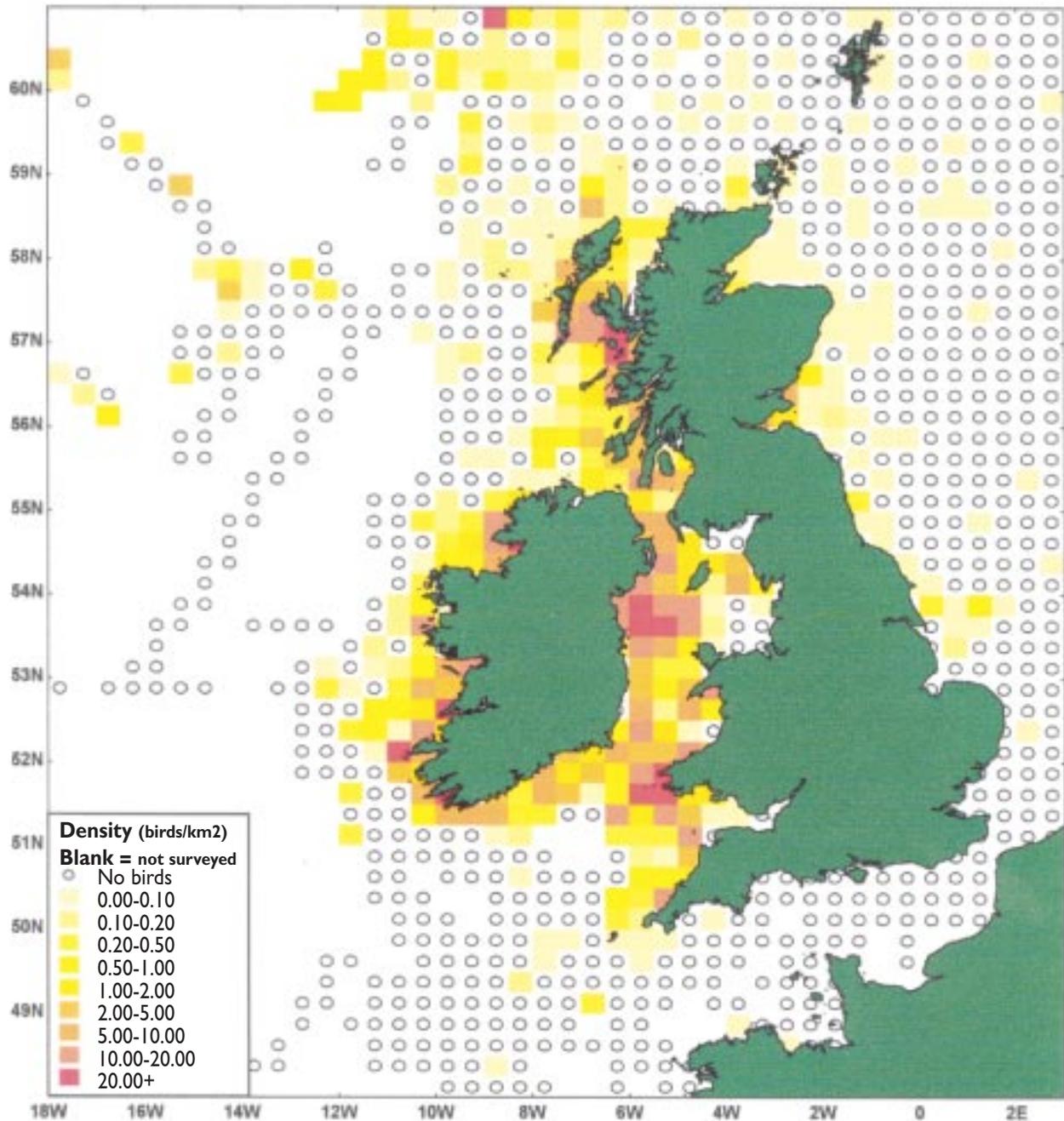
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Irish Sea Pilot

Manx Shearwater distribution in July and August

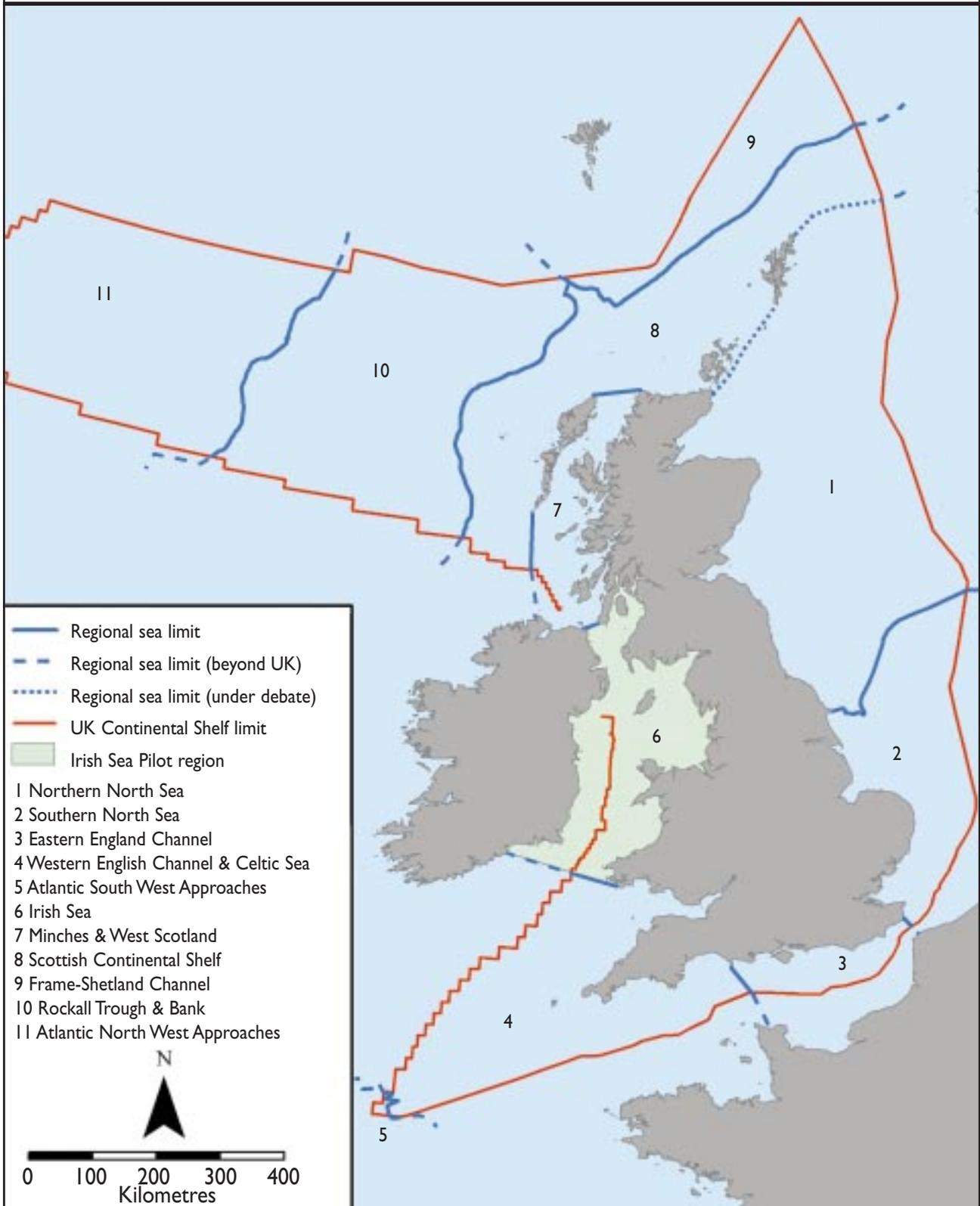


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Irish Sea Pilot Draft Regional Seas



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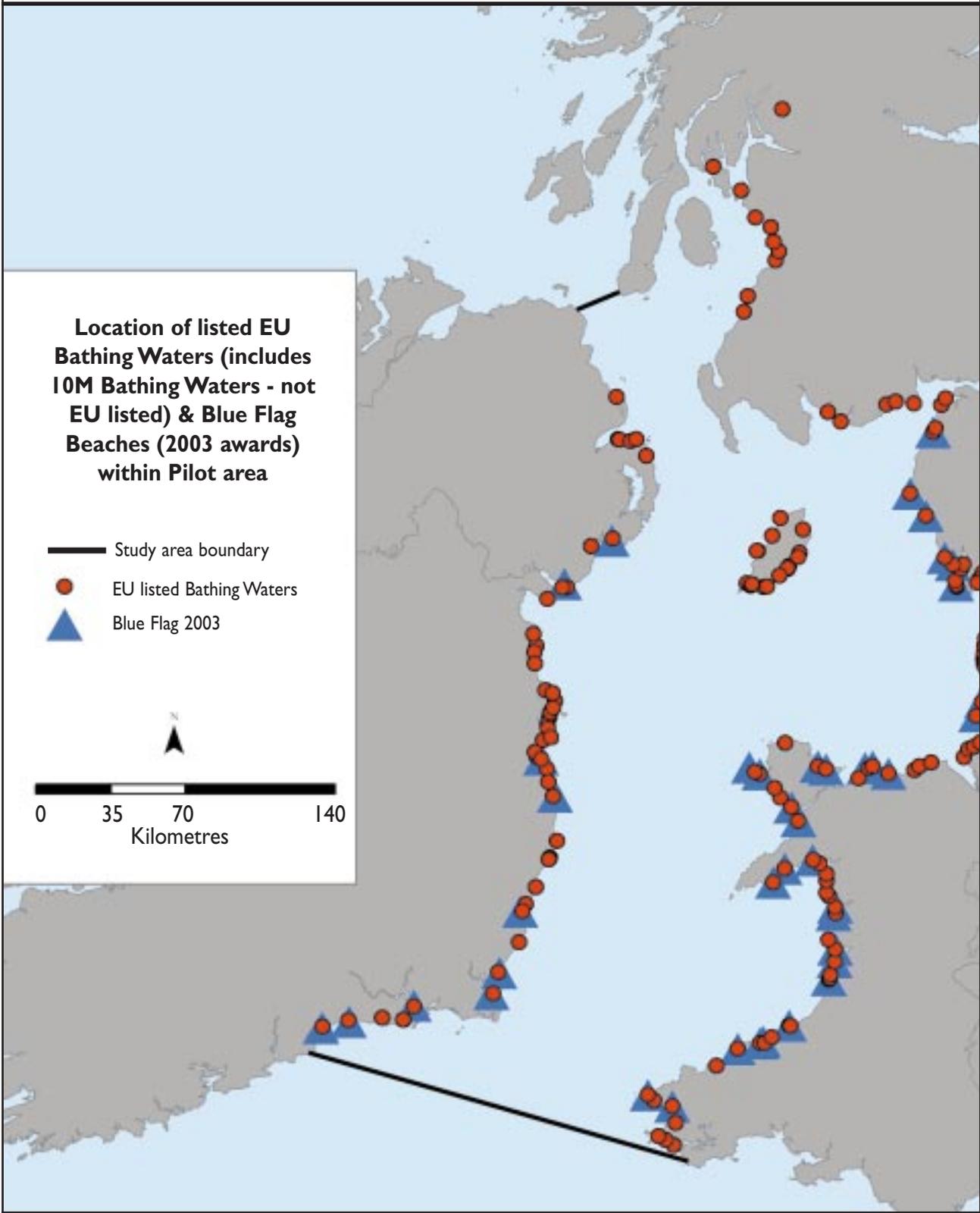
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Irish Sea Pilot EU Bathing Waters and Blue Flag Beaches



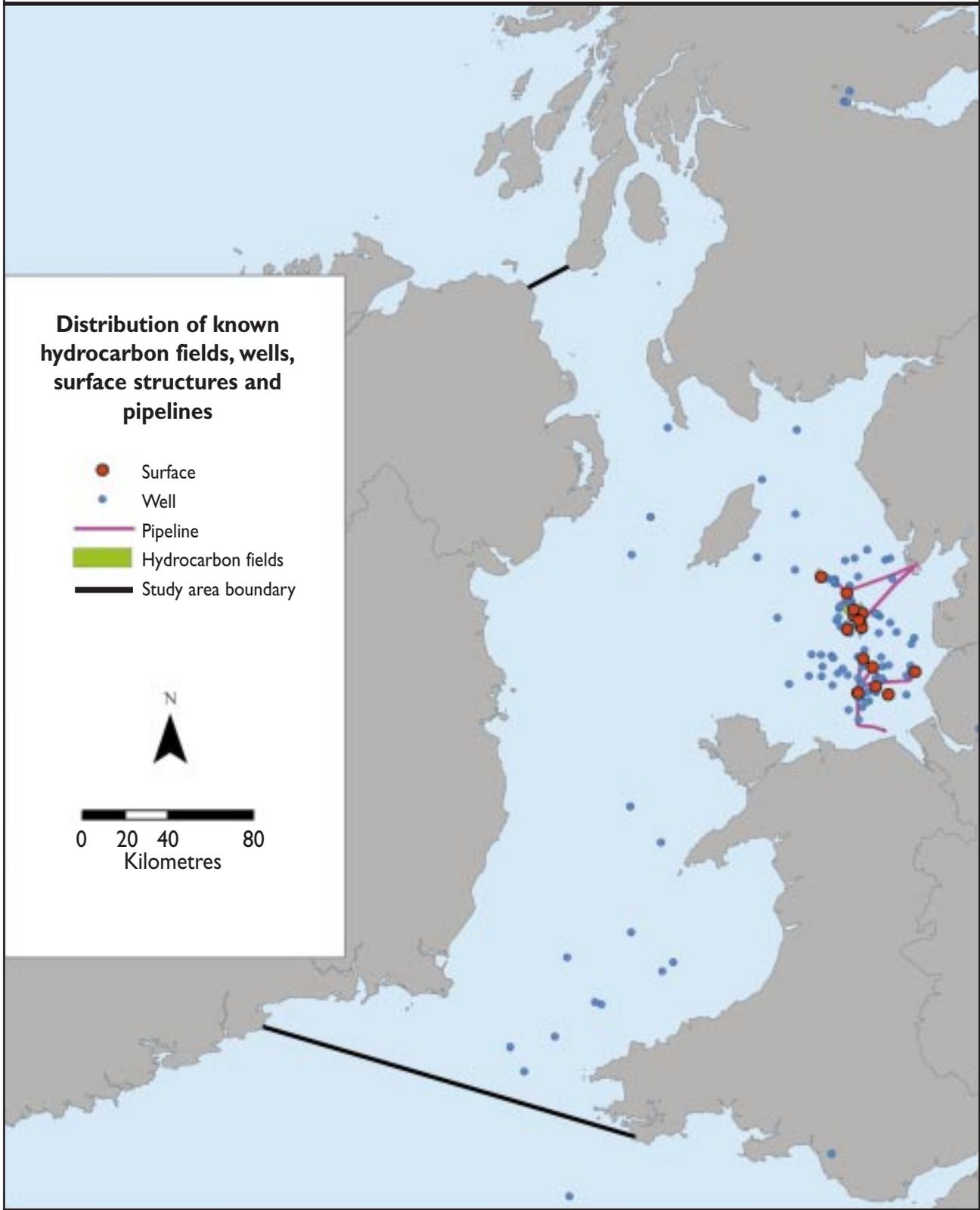
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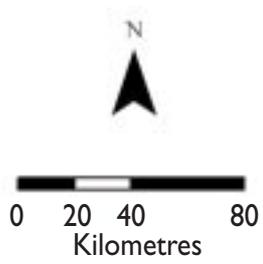
Irish Sea Pilot

Map of oil and gas activity



Distribution of known hydrocarbon fields, wells, surface structures and pipelines

- Surface
- Well
- Pipeline
- Hydrocarbon fields
- Study area boundary

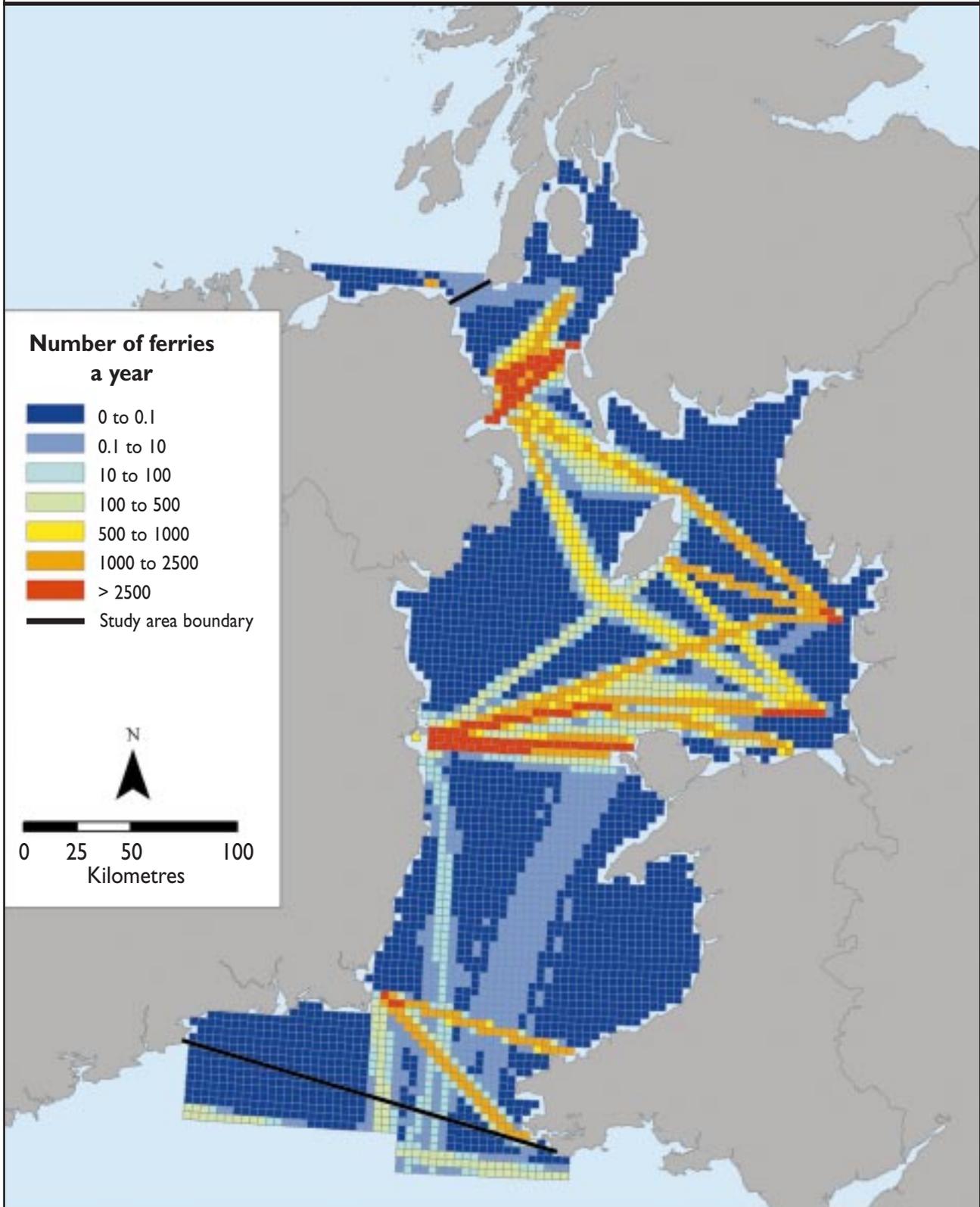


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Irish Sea Pilot Shipping: ferries

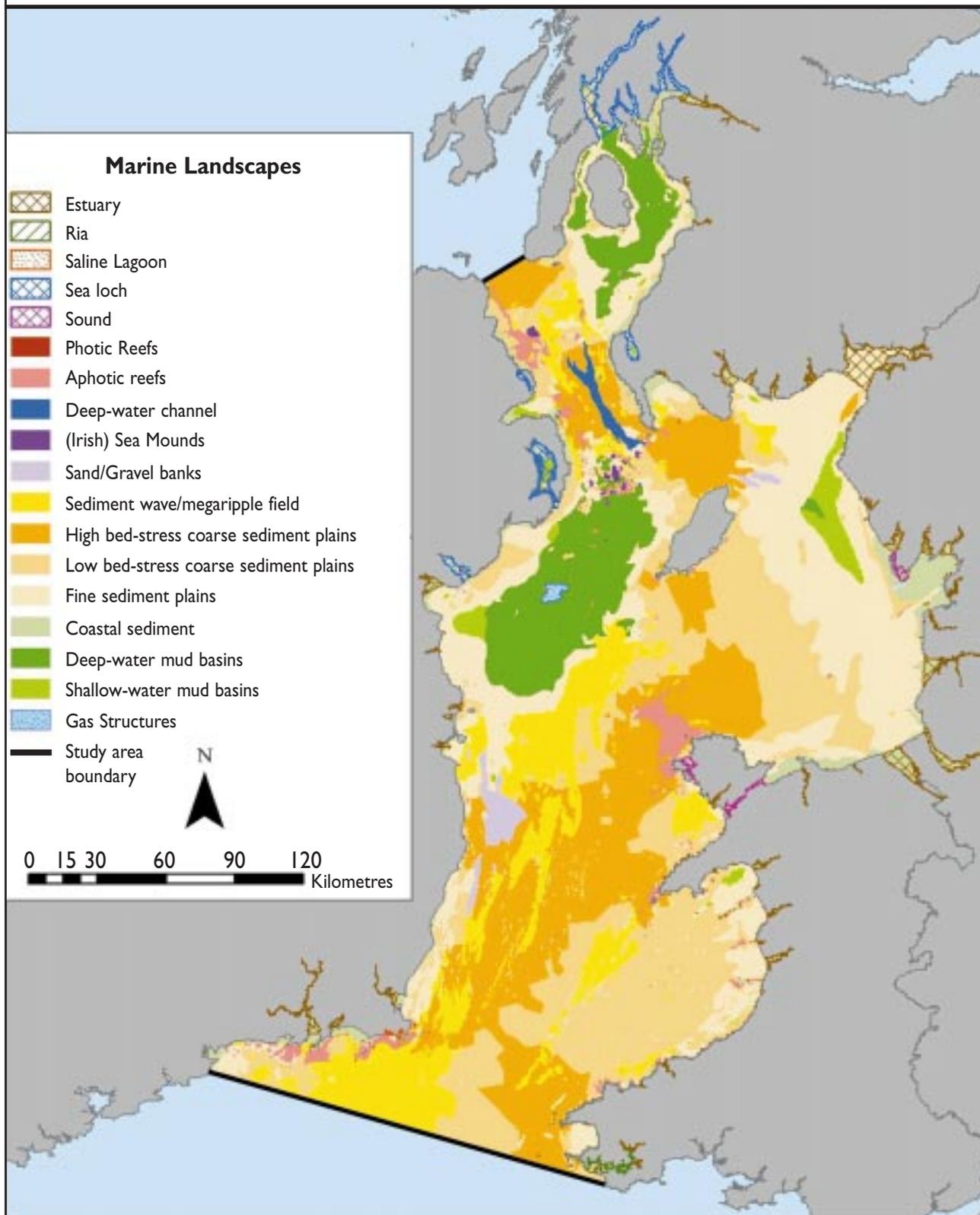


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Irish Sea Pilot Marine Landscapes



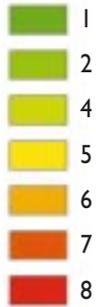
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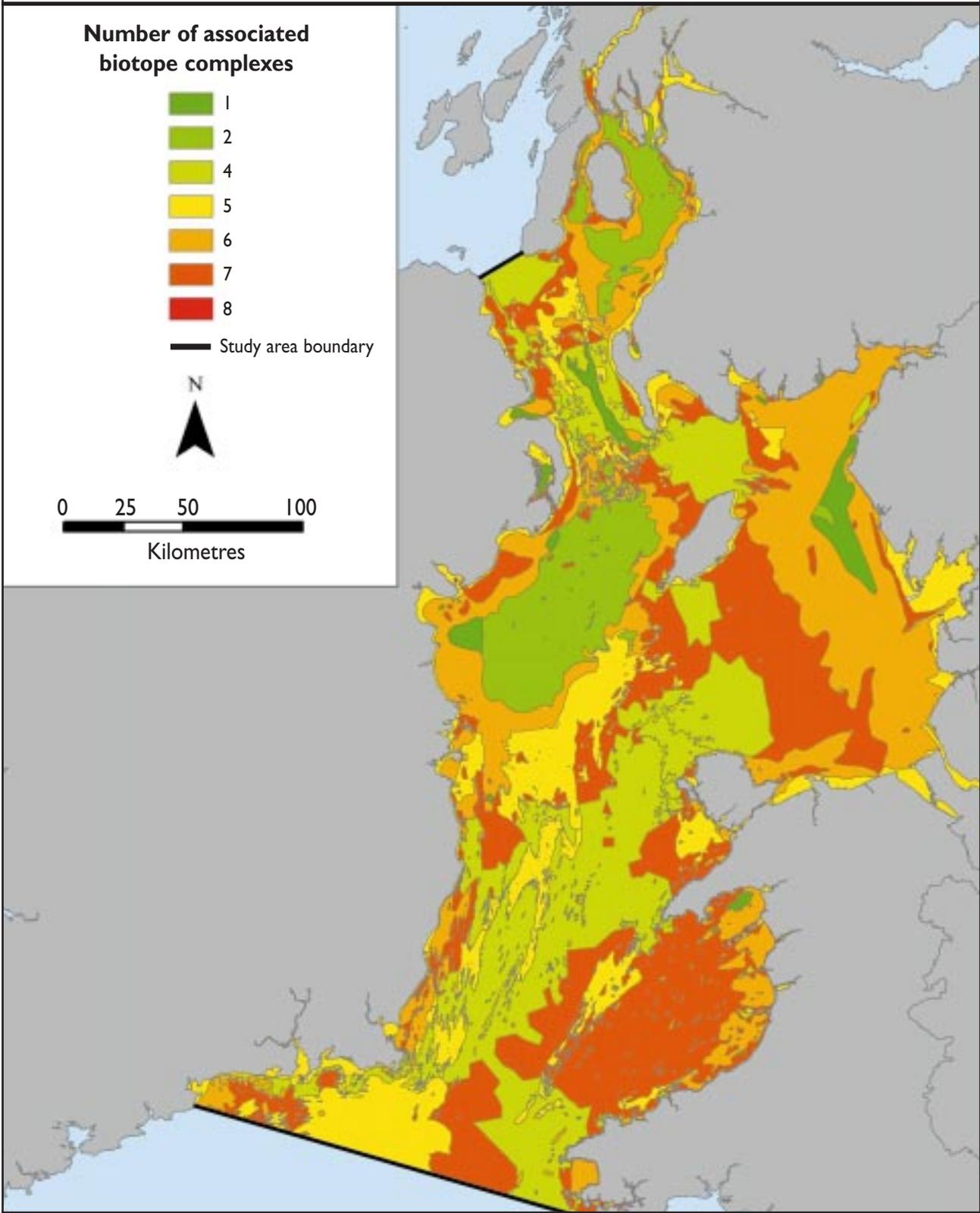
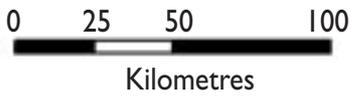


Irish Sea Pilot Marine Landscapes showing number of associated biotope complexes

Number of associated
biotope complexes



— Study area boundary

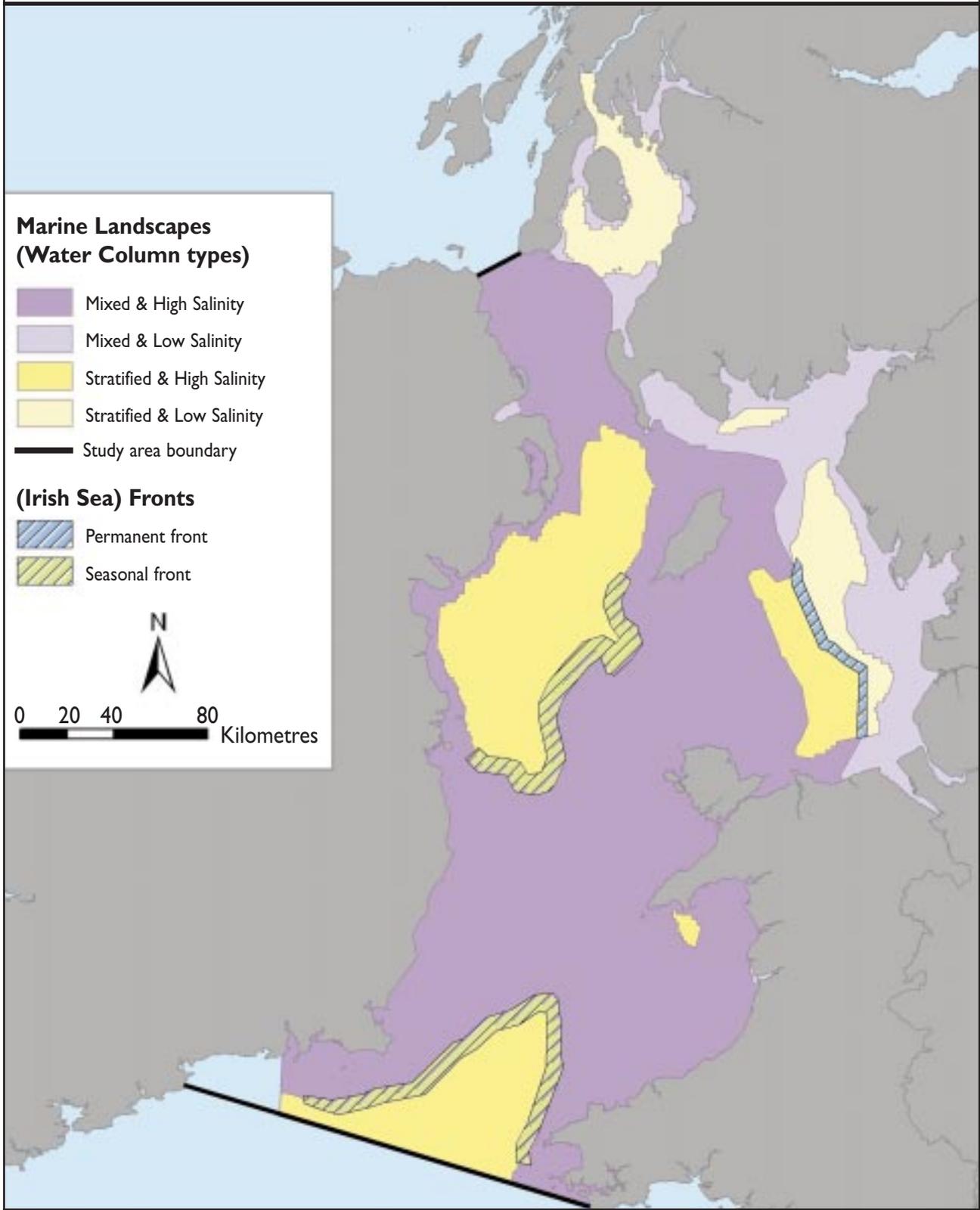


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Irish Sea Pilot Marine Landscapes (Water Column types)



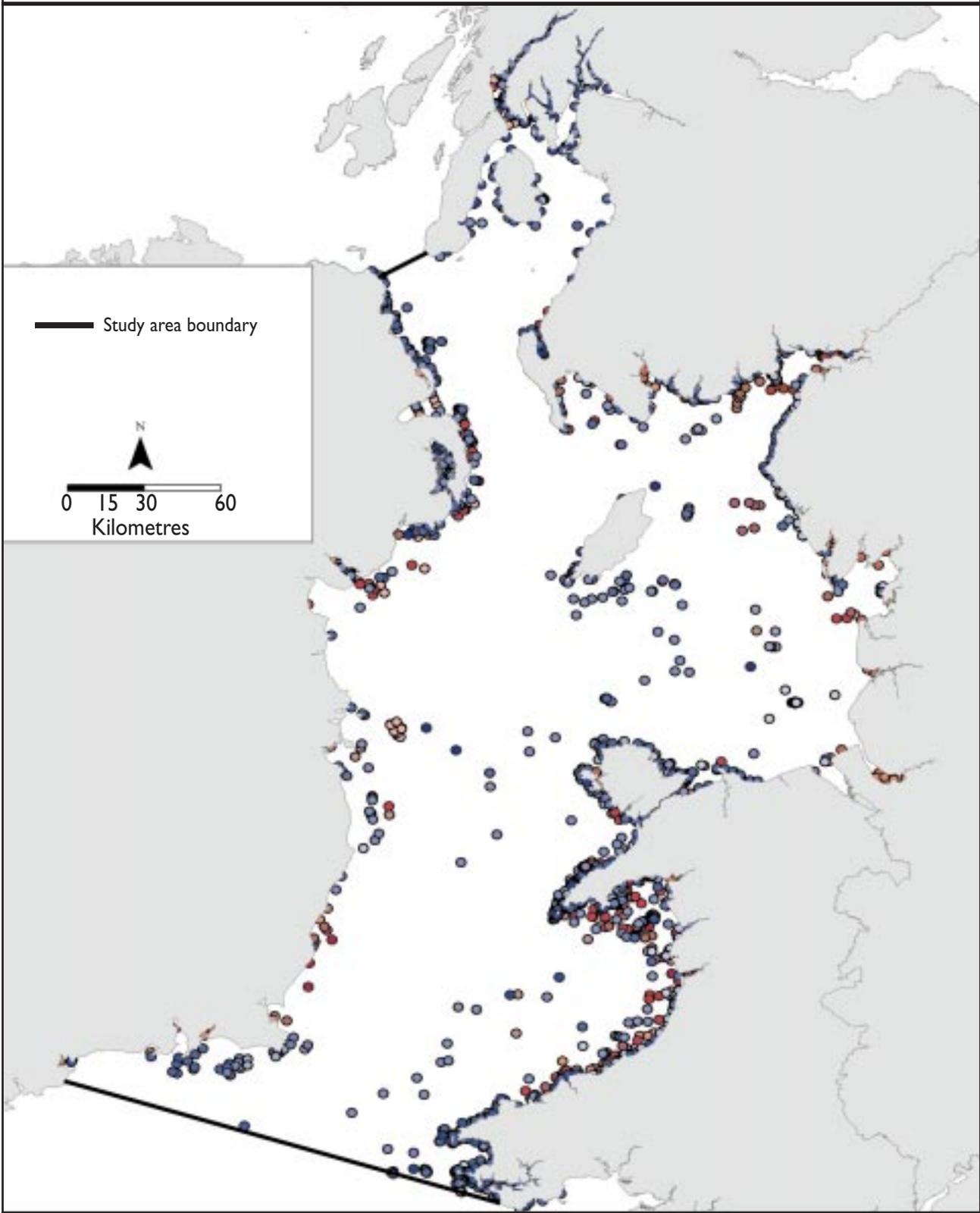
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Irish Sea Pilot

Records of provisionally important benthic and algal species (blue dots) and habitats (red dots)



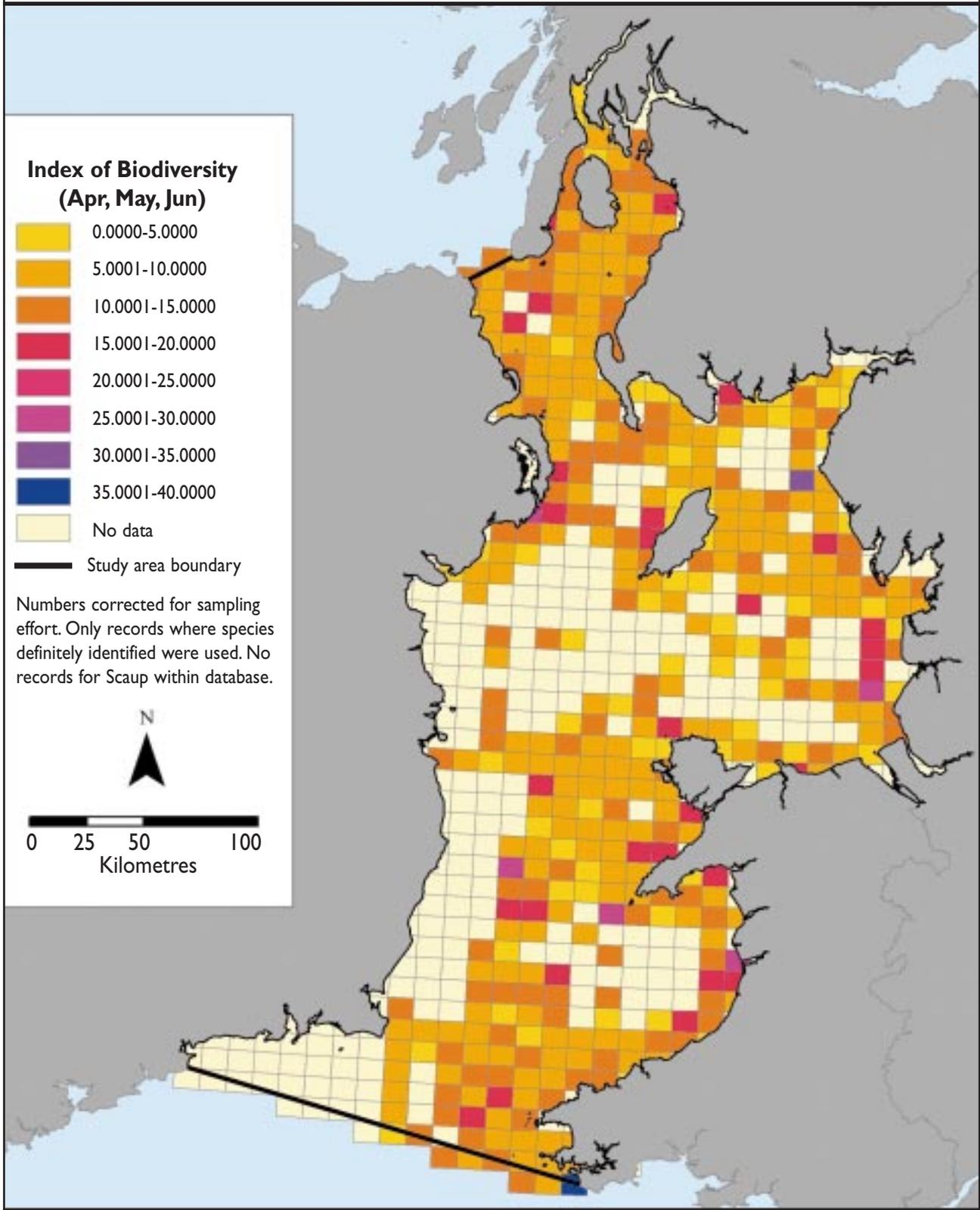
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Irish Sea Pilot

Spring Seabird hotspots based on 5' by 10' grid (Sum of nationally important species)

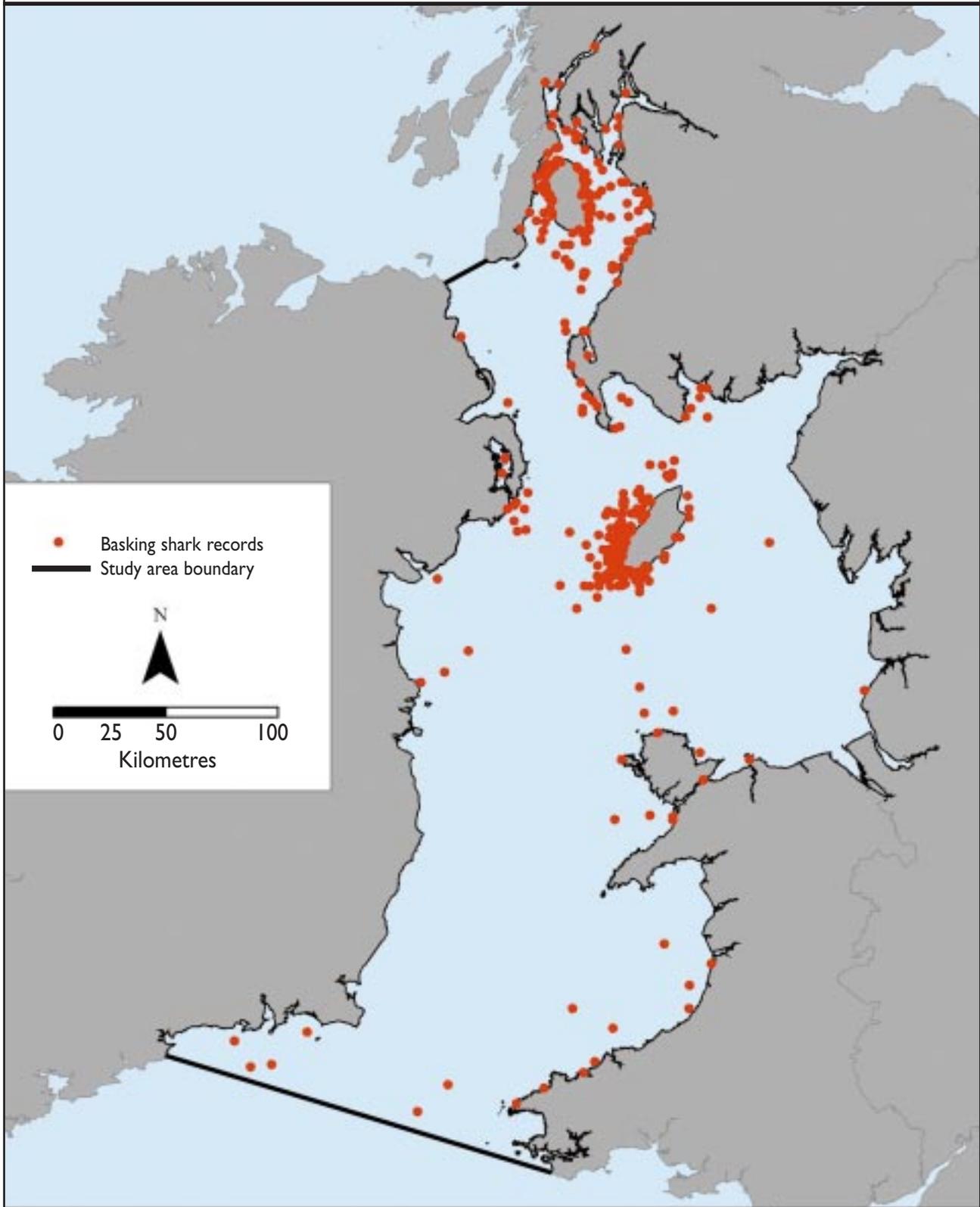


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Irish Sea Pilot Location of Basking Shark sightings

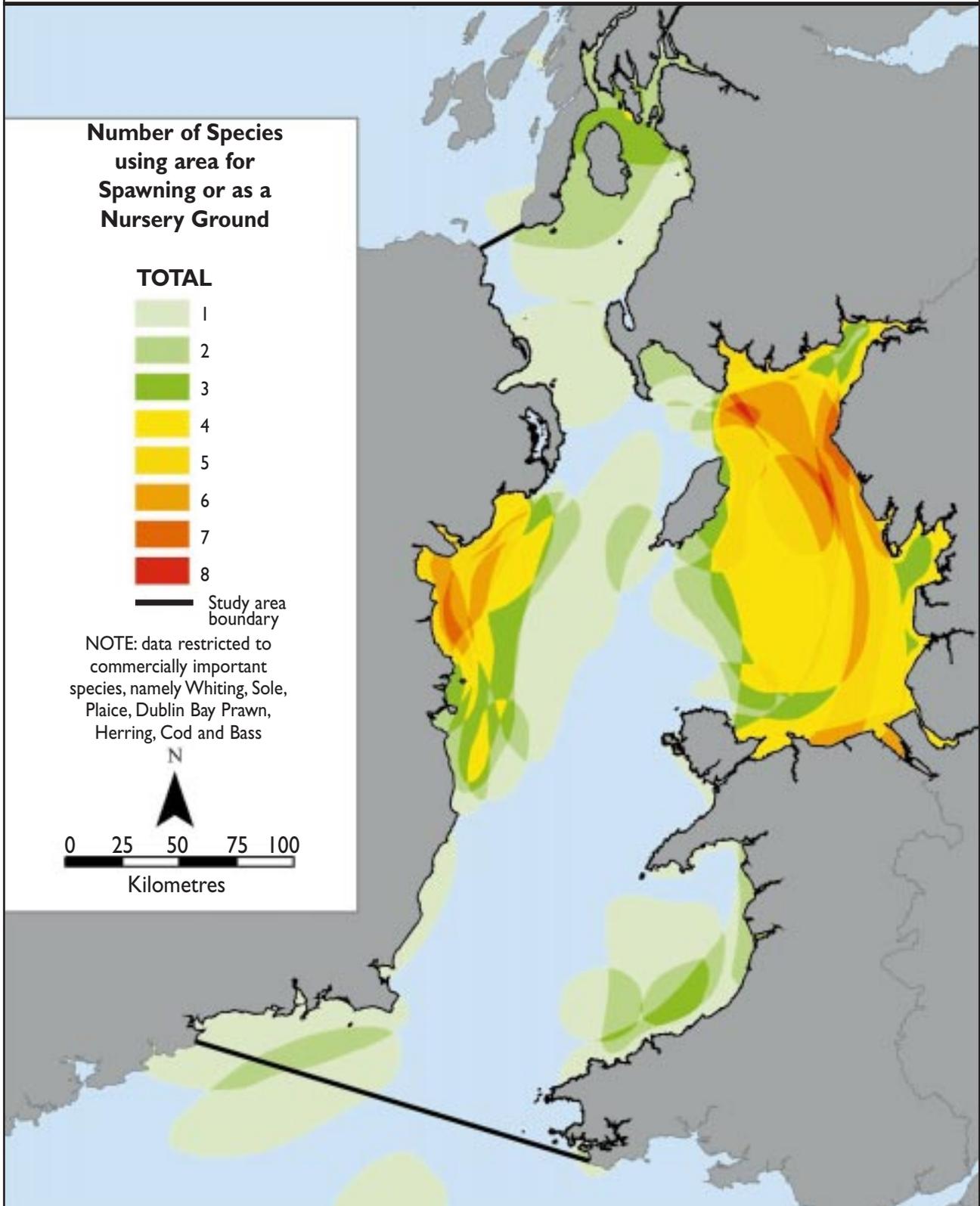


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Irish Sea Pilot Nursery and Spawning Grounds for Commercially Important Fish



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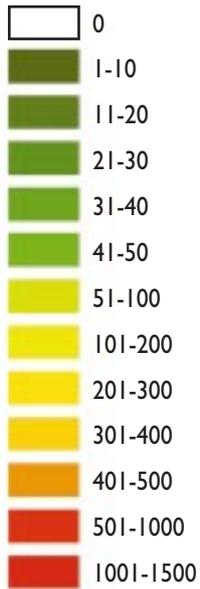
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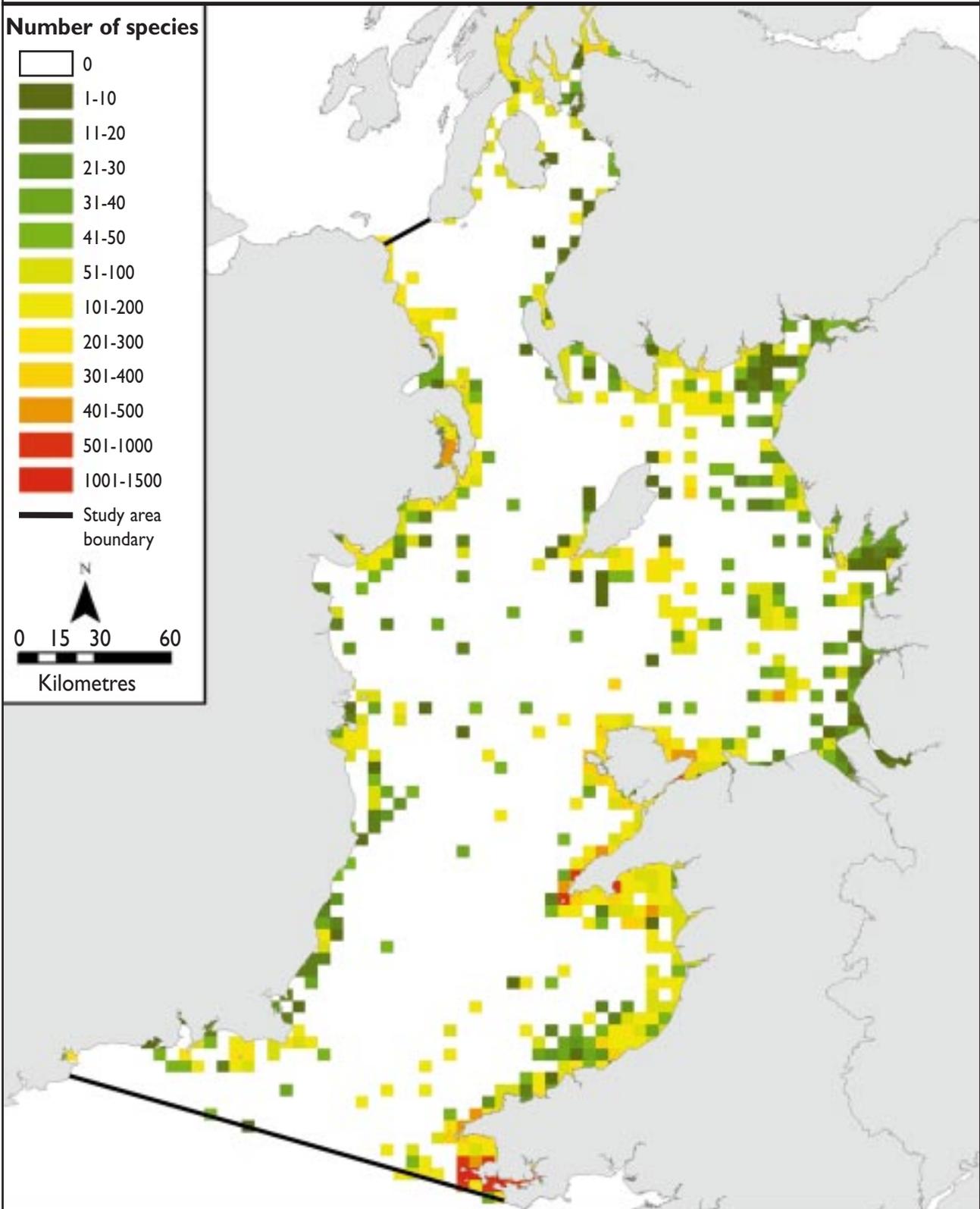
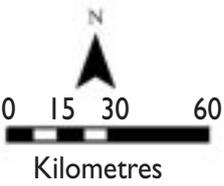
Irish Sea Pilot

Numbers of benthic species recorded in 5km by 5km grid cells

Number of species



Study area boundary



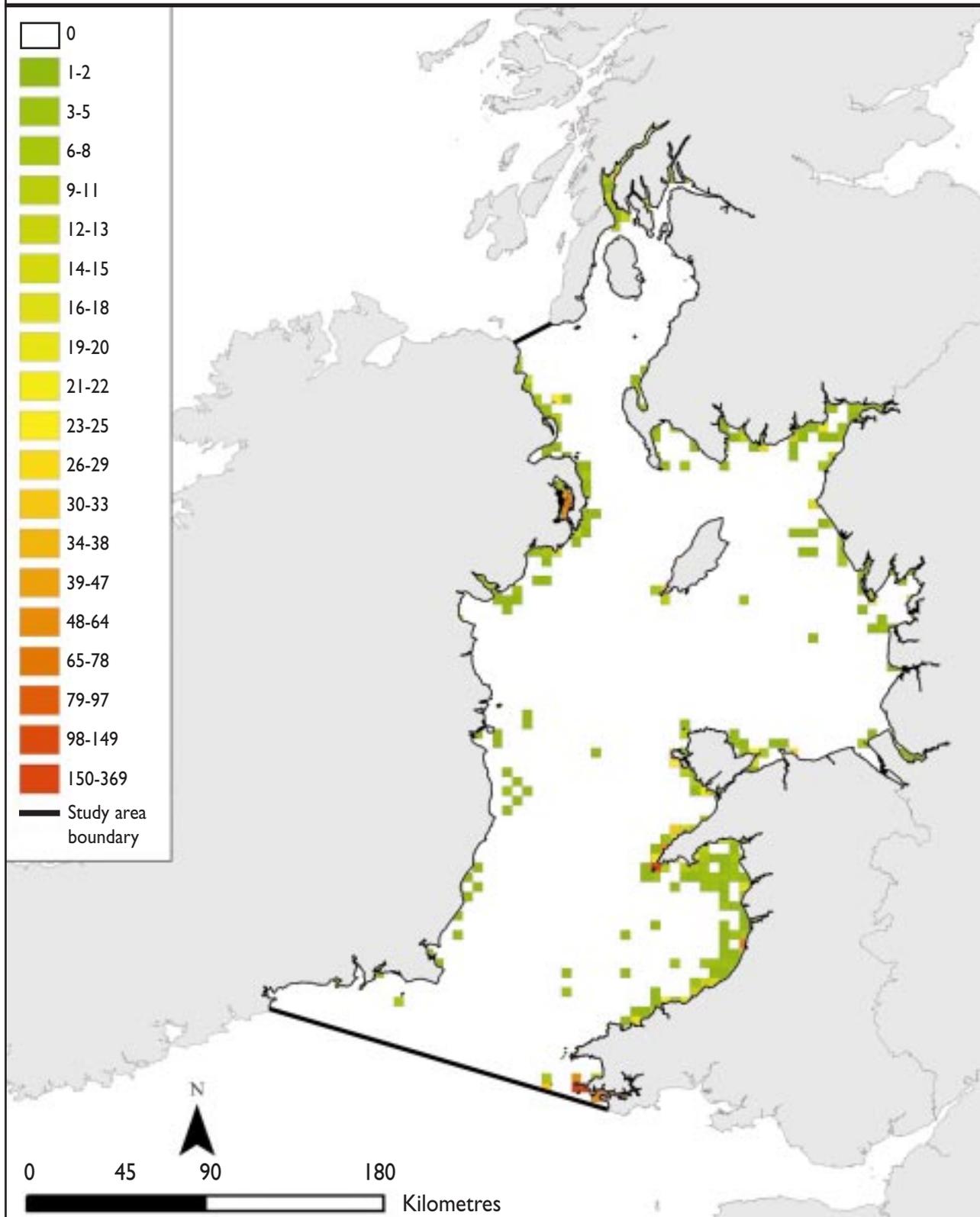
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Irish Sea Pilot

Numbers of provisionally nationally important habitats and benthic species recorded in 5km by 5km grid cells



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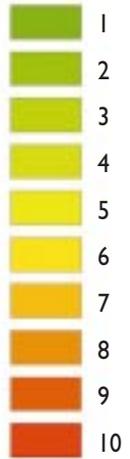
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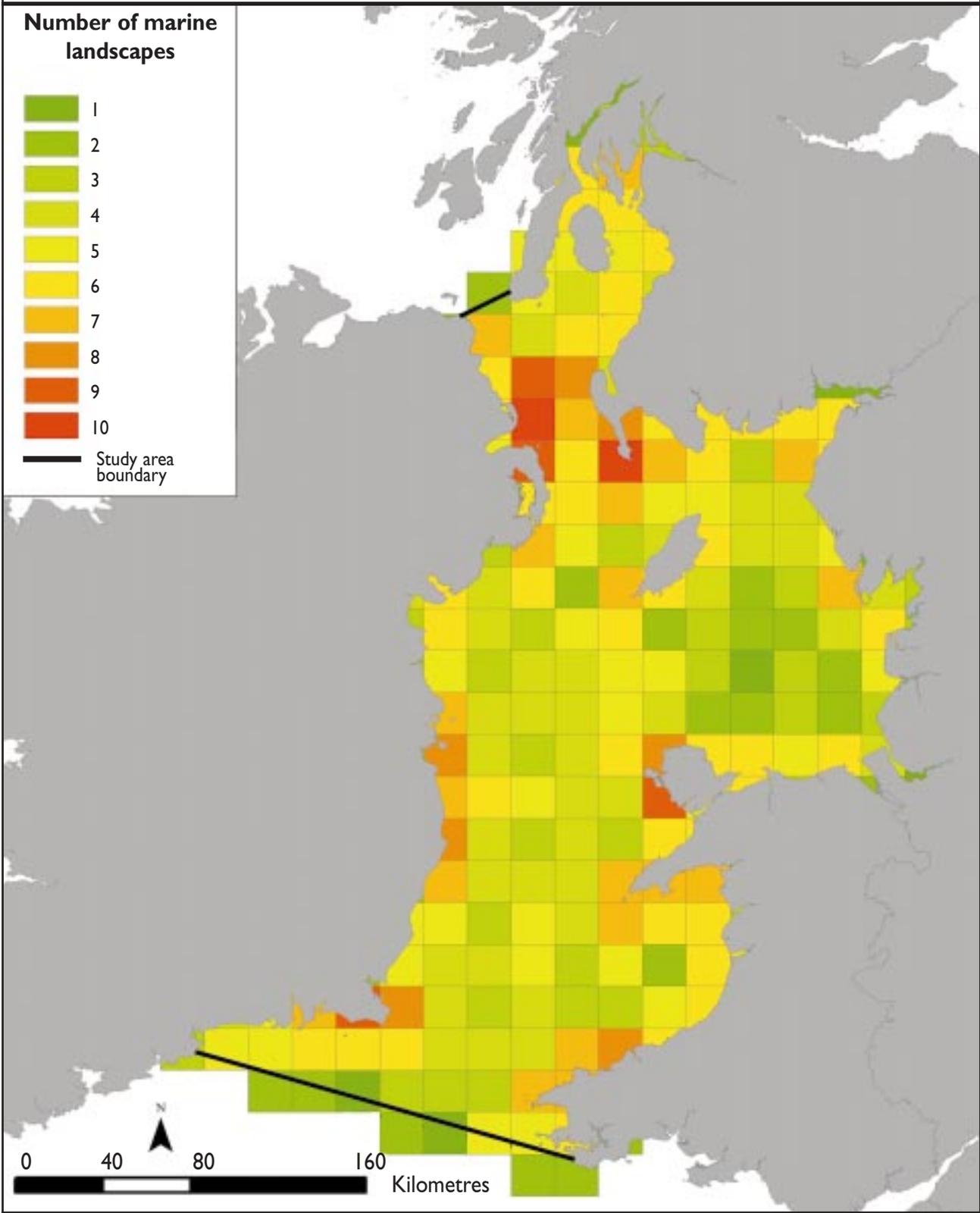
Irish Sea Pilot

Number of Marine Landscapes occurring within 20 by 20km grid cells

Number of marine landscapes



Study area boundary

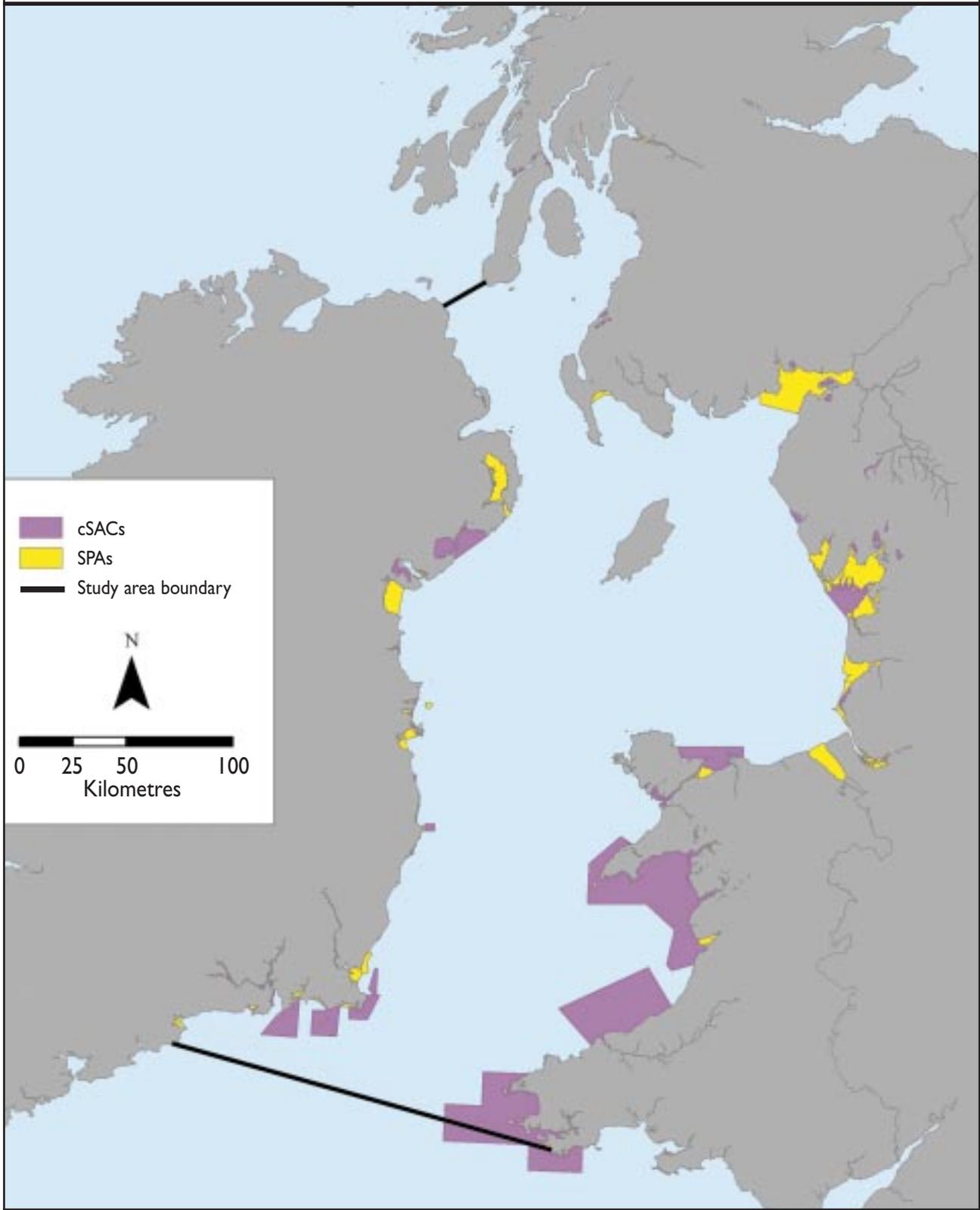


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Irish Sea Pilot Special Protection Areas (SPAs) and candidate Special Areas of Conservation (cSACs)



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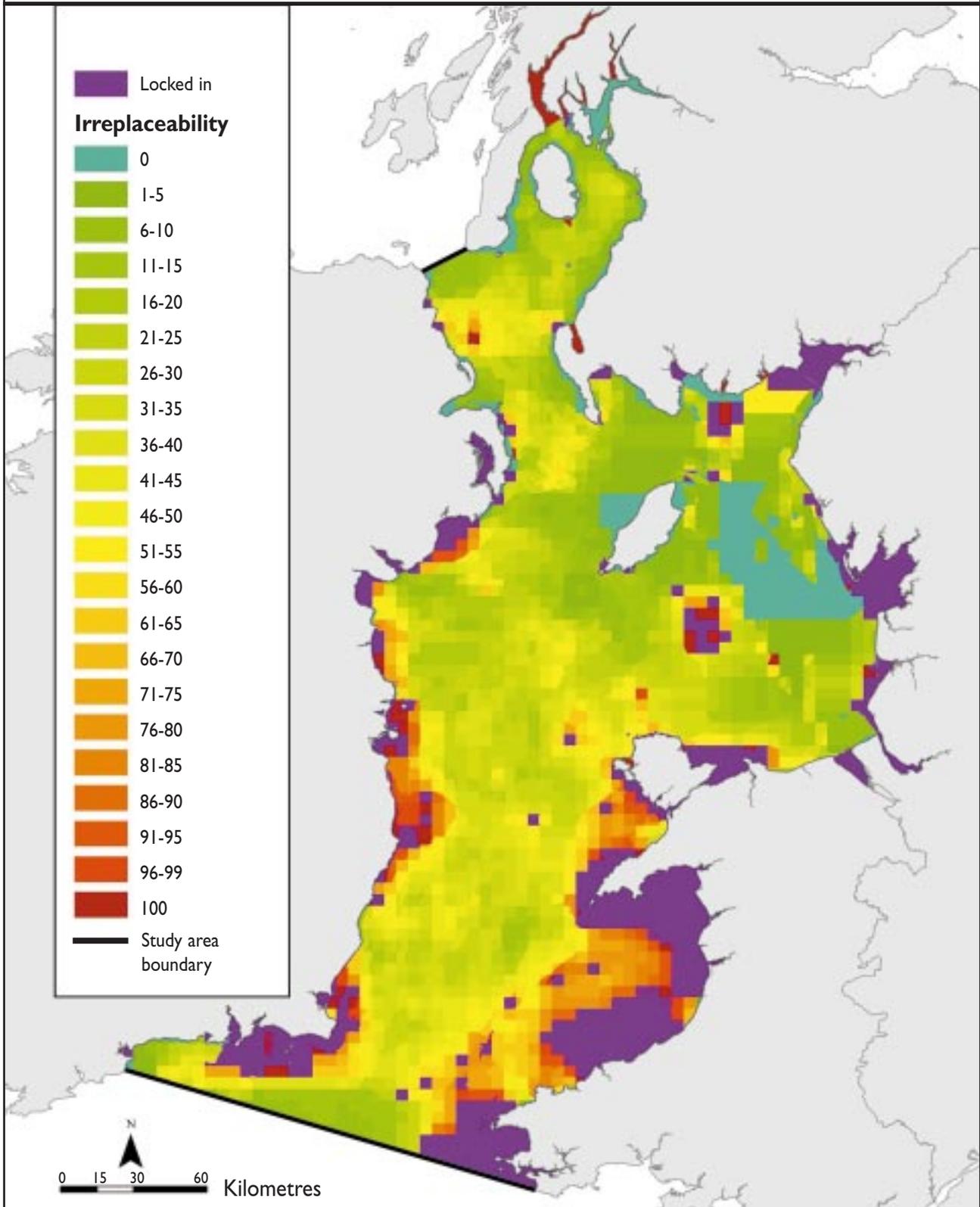
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Irish Sea Pilot

Irreplaceability: locking in biodiversity, estuaries, SACs and SPAs with naturalness



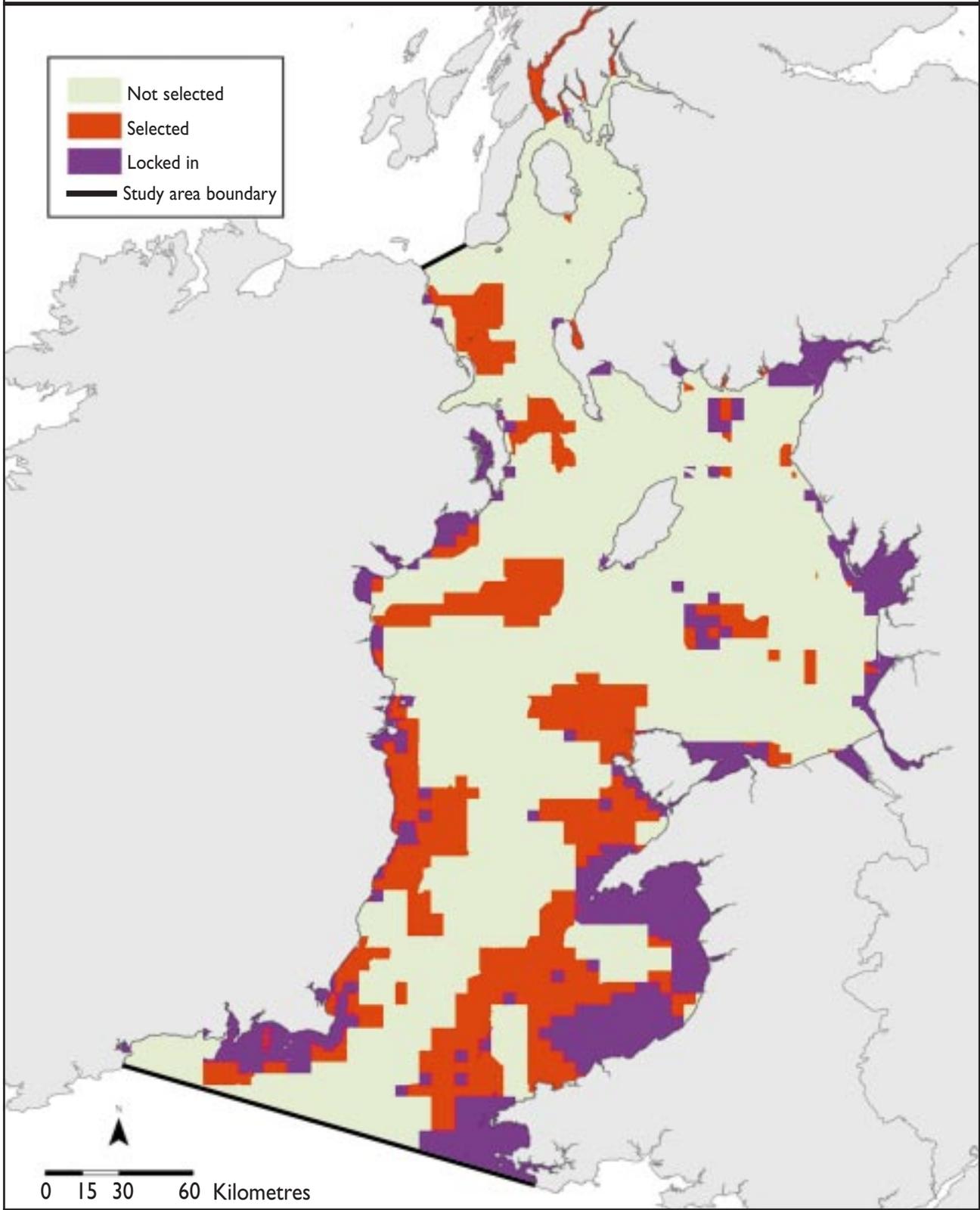
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Irish Sea Pilot

“Best Solution”: Locking in biodiversity, estuaries, SACs and SPAs with naturalness



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▲ The honeycomb reef worm *Sabellaria alveolata* builds massive reef structures along some lower sandy shores. © JNCC.



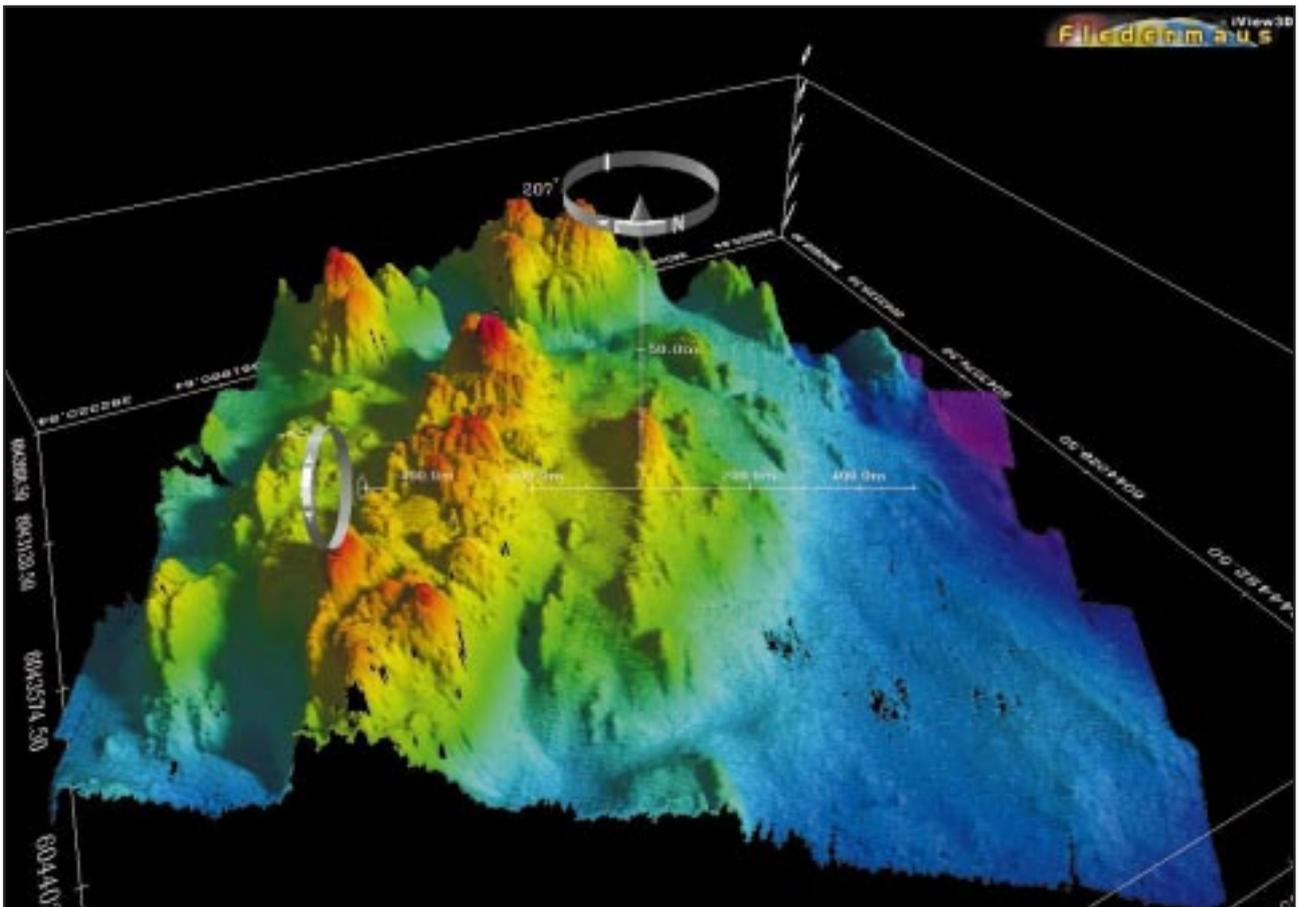
▲ A Dublin Bay prawn *Nephrops norvegicus* in its burrow in the Deep water mud basin marine landscape. © Chris Lumb/JNCC.



▲ Dense horse mussel *Modiolus modiolus* beds form species-rich habitats in scattered localities in the northern Irish Sea. © Jon Davies



▲ Jewel anemones *Corynactis viridis* can form large multi-coloured sheets on rocky reefs below low water. © Maura Mitchell.



▲ A three-dimensional bathymetric image of the *Irish Sea mounds* marine landscape. This example rises from the seabed (130m deep) to within 50m of the surface (from RV Lough Foyle cruise). © Crown copyright.



▲ The UK population of bottlenose dolphins *Tursiops truncatus* numbers several hundred of which about half live in the Irish Sea, mainly in Cardigan Bay. © P.G.H. Evans



▲ Basking sharks *Cetorhinus maximus* grow to 10m in length. They filter plankton, taking advantage of productive near-surface waters, and occur regularly off the coasts of the Isle of Man and Arran. © Naturepl.com



▲ 80% of the world population of Manx shearwater *Puffinus puffinus* breed in the UK. The Pembrokeshire Islands hold important breeding colonies, with smaller colonies on islands off Co. Waterford and Co. Down. © Nature Photographers.



▲ Spider crabs *Inachus* sp. on rippled medium/fine sand, representing the *Sediment wave/megaripple field* marine landscape at 31m depth, Caernarfon Bay, Wales. © Crown copyright.



▲ Numerous dahlia anemones *Urticina* sp. on rock partly covered by sand, an example of the *Aphotic reef* marine landscape at 40m depth, north of Anglesey. © Crown copyright.



▲ Photosledge with still camera system (black housing) and video camera and lights (red plug retainers), used on the *RV Prince Madog* cruise. © Crown copyright.

11. CONSERVATION OBJECTIVES

294. With the main levels of the draft framework for marine nature conservation identified (the Wider Sea, Regional Sea, marine landscapes, nationally-important features and nationally-important areas), it was considered necessary to set appropriate conservation objectives for these. Such conservation objectives would serve as a benchmark against which to assess the likely harm to the marine environment from human activities, and thus guide the management of human activity.
295. Originally, it had been envisaged that it would be desirable to develop conservation objectives at each of the various levels of the framework for marine nature conservation, but as work on the Pilot progressed it became clear that such an approach would not only be very onerous to develop technically, but, more importantly, be extremely difficult to implement in practice because of its complexity. Moreover, the results of initial work commissioned on conservation objectives from the Nature Bureau, and also discussions held with stakeholders, illustrated that the primary benefits of identifying conservation objectives would be likely to accrue at the Regional Sea level, and that necessary refinements at other levels could be achieved through fine tuning.
296. In order to set nature conservation most effectively within the overall context of Sustainable Development, it was felt necessary to align the conservation objectives, wherever possible, with the objectives of other sectors. To help achieve this, the Pilot first considered the position of conservation objectives within the context of Strategic Goals for the marine environment.

Strategic goals for the marine environment

297. The Pilot considered that there should be a clear line of sight between the vision and strategic goals for the marine environment in general, right through to the specific actions needed to deliver marine nature conservation. The vision has been set out in *Safeguarding our Seas* (Defra, 2002a), and strategic goals proposed in *Seas of Change* (Defra, 2002b).

Vision for the UK marine environment:

‘Clean, healthy, safe, productive and biologically diverse oceans and seas. We want to see this both nationally and globally. Within one generation we want to have made a real difference.’

Proposed strategic goals for the UK marine environment:

1. To conserve and enhance the overall quality of our seas, their natural processes and biodiversity;
2. To use marine resources in a sustainable and ecologically sensitive manner in order to achieve maximum environmental, social and economic benefit from the marine environment;
3. To sustain economic benefits and growth in the marine environment by enabling and encouraging environmentally sustainable employment;
4. To increase our understanding of the marine environment, its natural processes and our cultural marine heritage;
5. To promote public awareness, understanding and appreciation of the marine environment and seek active public participation in the development of new policies.

These strategic goals have been the subject of wide consultation since they were published and they may be refined.

298. There are also many international and European targets for the marine environment which the UK and other governments need to meet. These targets have been incorporated into the approach to defining conservation objectives.

International and European targets for the marine environment which the UK government needs to meet, include:

1. Halt the decline of biodiversity across the European Union by 2010 (EU 6th Environmental Action Programme);
2. Encourage the ecosystem approach in marine management by 2010 (World Summit on Sustainable Development, 2002); ecosystem-based management approach formally endorsed by UK (5th North Sea Conference);
3. Identify and designate by 2010 relevant areas of the UK's seas as areas of marine protection belonging to a network of well managed sites (5th North Sea Conference and OSPAR Convention);
4. Restore depleted fish stocks to maximum sustainable yields by 2015 'where possible' (WSSD);
5. Maintain or restore natural habitats and species of wild fauna and flora to a favourable conservation status (EC Habitats Directive);
6. Prevent further deterioration in and protect and enhance the status of aquatic ecosystems, including estuarine and coastal waters (EC Water Framework Directive).

Conservation objectives for the Irish Sea

299. The focus of this chapter is to develop an approach to the setting of conservation objectives which addresses the first of the strategic goals referred to in paragraph 297, namely *'to conserve and enhance the overall quality of our seas, their natural processes and biodiversity'* and make a significant contribution to the second goal *'to use marine resources in a sustainable and ecologically sensitive manner in order to achieve maximum environmental, social and economic benefit from the marine environment'*. The approach taken is one which can be applied to the various levels of the draft framework for marine nature conservation.

300. For the purpose of setting conservation objectives, the Regional Sea is considered as having three components: the physical and chemical properties of the Regional Sea, its productivity and its biodiversity. It is proposed to set an aim for each of these components as follows:

- i. to maintain the physical and chemical properties of the ecosystem;
- ii. to maintain each component of the ecosystem so that it can make its expected contribution to the food web;
- iii. to prevent further loss of marine biodiversity, and promote its recovery where practicable, so as to maintain the natural richness and resilience of the ecosystem.

301. For each of these aims a series of high level conservation objectives has been developed. For example, under the first aim *'to maintain the physical and chemical properties of the ecosystem'* four high level conservation objectives are proposed:

- i. to protect seabed features so that they can support the processes, habitats and species characteristic of the marine landscapes;

- ii. to protect water column features so that they can support the processes, habitats and species characteristic of the water column;
 - iii. to protect the water quality of the component water column features so that they can support the processes, habitats and species characteristic of the water column and associated seabed habitats;
 - iv. to protect biota quality.
302. Each high level conservation objective has been further refined by the development of one or more 'operational' conservation objectives. The operational conservation objectives are defined in one of the following ways:
- i. compliance with standards aimed at protecting the marine environment;
 - ii. protection or recovery from adverse impacts due to human activity;
 - iii. achievement of a particular target state or level.

An example of an operational conservation objective would be to *'recover spawning stock biomass of commercially-exploited fish/shellfish species stocks to within safe biological limits'*.

303. The purpose of defining conservation objectives at an 'operational' level is to provide practical guidance for management. The format employed is designed so that the operational conservation objectives can be integrated with the ecological quality objectives being developed under OSPAR. Progress towards achieving the operational conservation objectives would be assessed by defining and monitoring indicators and targets set for these objectives. There may be an opportunity to use higher level indicators and targets to cover a suite of operational conservation objectives (a marine equivalent to the 'farmland bird indicator').
304. In defining the operational conservation objectives (and particularly when assessing progress towards meeting them) account needs to be taken of the natural variability of the marine ecosystem. Some elements of the ecosystem are highly dynamic whilst others are more stable. The operational conservation objectives aim to safeguard the natural variability through protecting the marine environment from significant change due to human activity, thereby avoiding or minimising disturbance to natural variability and natural processes.
305. A set of proposed operational conservation objectives is provided in Table 8 below for the three strategic goals and the high level objectives. The set of objectives provides a structure to help identify and integrate what needs to be achieved to contribute to meeting a wide range of international and European commitments and targets for marine nature conservation, including those listed in paragraph 298 above, and the sustainable development of the marine environment.
306. These conservation objectives would apply at the UK and Regional Sea levels. Once agreed, the conservation objectives are unlikely to require significant change over time.

Table 8: Conservation Objectives

Aim 1: To maintain the physical and chemical properties of the ecosystem		
High level objectives	Ecosystem components (illustrative)	Operational conservation objectives
1. Protect seabed features so that they can support the processes, habitats and species characteristic of the marine landscapes.	Coastal morphology <ul style="list-style-type: none"> • coastal processes 	1.1 Protect coastal processes from ecologically-significant change due to human activity, and reverse such change where practicable.
	Seabed habitats <ul style="list-style-type: none"> • substratum type • particle size composition • topography • substratum structure • siltation • physical processes • chemical processes 	1.2 Protect seabed habitats from ecologically-significant change due to human activity, and reverse such change where practicable.
	Biogenic structures <ul style="list-style-type: none"> • saltmarshes • eelgrass beds • Sabellaria spp reefs • Modiolus reefs 	1.3 Protect biogenic structures from ecologically-significant change due to human activity, and reverse such change where practicable.
2. To protect water column features so that they can support the processes, habitats and species characteristic of the waterbodies.	Water column features <ul style="list-style-type: none"> • Tides, waves, fetch, currents • Fronts • Stratification • Temporal changes • Freshwater inputs • Salinity • Suspended solids • Turbidity 	2.1 Protect the water column features from ecologically-significant change due to human activity, and reverse such change where practicable.
3. Protect the water quality of the component water column features so they can support the processes, habitats and species characteristic of the water column and associated seabed habitats.	Water quality <ul style="list-style-type: none"> • Chemical conditions • Nutrients • Dissolved gases 	3.1 Maintain or recover water quality to within defined standards which aim to prevent 'undesirable disturbance' caused by eutrophication.
	Chemical pollutants <ul style="list-style-type: none"> • Contaminants • Organic compounds • Radioactive elements 	3.2 Ensure that environmental standards are not exceeded.
	Oil <ul style="list-style-type: none"> • Chronic • Acute 	3.3 Ensure that environmental standards are not exceeded. 3.4 Reduce the input of oil from accidents, as far as practicable.
	Noise and vibration	3.5 Maintain noise and vibration levels below precautionary standards aimed at protecting vulnerable marine species from disturbance.
	Marine litter	3.6 Reduce input of litter to the marine environment to below levels aimed at protecting vulnerable marine habitats and species.
4. Maintain biota quality	Contaminants <ul style="list-style-type: none"> • Contaminant loads • Bioaccumulations • Health of animals 	4.1 Ensure standards for contaminants in biota are not exceeded.

Table 8: (continued)

Aim 2: To maintain each component of the ecosystem so that it can make its expected contribution to the foodweb		
High level objectives	Ecosystem components (illustrative)	Operational conservation objectives
1. Maintain primary production within bounds of natural variability	Trophic status <ul style="list-style-type: none"> • nutrient concentrations, • water clarity, • chlorophyll A concentration 	1.1 Ensure compliance with precautionary standards which aim to avoid ‘undesirable disturbance’ of trophic status.
2. Maintain trophic structure so that individual species and stages can sustain their characteristic roles in the foodweb	Trophic complexity <ul style="list-style-type: none"> • number of trophic levels • biomass at each trophic level 	2.1 Ensure harvest of all species at a specified trophic level is below precautionary limits.
	Habitat availability: <ul style="list-style-type: none"> • pelagic habitats • benthic habitats • nursery areas • spawning areas • migration pathways 	2.2 To protect the extent and function of habitats, areas and pathways from significant decline due to human activities.
	Predator-prey relationships <ul style="list-style-type: none"> • predator-induced mortality rates on prey populations • biomass of key dependent predators: <ul style="list-style-type: none"> ◦ commercially exploited fish/shellfish ◦ non-target fish species ◦ benthic animals ◦ birds ◦ marine mammals 	2.3 Reduce direct and indirect impacts upon prey populations to below levels at which their populations may be affected. 2.4 Reduce direct and indirect impacts upon key dependent predators to below levels at which their populations may be significantly affected.
3. Maintain mean generation times of populations within bounds of natural variability	Longevity <ul style="list-style-type: none"> • survivorship curves • mortality rate 	3.1 Protect populations from changes in longevity which may have a significant impact upon the marine ecosystem, due to human activity.
	Life history strategy <ul style="list-style-type: none"> • changes in reproductive parameters (age of maturity, time of breeding) • lifetime reproductive success rates 	3.2 Protect populations from changes in life history strategy which may have a significant impact upon the marine ecosystem, due to human activity.
	Reproductive potential <ul style="list-style-type: none"> • fecundity • spawning stock biomass 	3.3 Enable the spawning stock biomass of commercially-exploited fish/shellfish to recover to within safe biological limits. 3.4 Increase the spawning stock biomass of commercially-exploited fish/shellfish stocks further, to within limits defined for an ecologically-sustainable fishery, where this is possible.
	Fishing mortality	3.5 Reduce fishing mortality of commercially-exploited fish/shellfish stocks to within safe biological limits 3.6 Reduce fishing mortality of commercially-exploited fish/shellfish stocks further, to within limits defined for an ecologically-sustainable fishery where this is possible.

Table 8: (continued)

Aim 3: To prevent further loss of marine biodiversity, and promote its recovery where practicable, so as to maintain the natural richness and resilience of the ecosystem		
High level objectives	Ecosystem components (illustrative)	Operational conservation objectives
1. Maintain habitats/communities within bounds of natural variability	Trophic level balance <ul style="list-style-type: none"> • effective number of species within each trophic level • abundance of keystone species 	1.1 Protect the trophic level balance from significant changes due to human activity.
	Habitat complexity <ul style="list-style-type: none"> • overall number of habitats/communities 	1.2 Prevent a significant decline in the habitat complexity of marine ecosystems due to human activity.
	Areas identified as being the ‘best representative examples’ of the range of marine landscapes, water body features habitats and species	1.3 Maintain the ‘best representative examples’ in, or recover them to, as close to their natural state as practicable.
	Rare and sensitive habitats	1.4 Protect rare and sensitive habitats from decline due to human activity.
	Habitats which are threatened by decline or have declined	1.5 Protect threatened habitats from decline due to human activity. 1.6 Enable habitats which have declined to recover to a non-threatened state, where practicable.
	Non-native species	1.7 Prevent the introduction of non-native species that may adversely impact the marine environment. 1.8 Reduce impacts of existing non-native species to below levels which risk affecting the marine ecosystem, where practicable.
2. Maintain species within bounds of natural variability	Overall diversity of species	2.1 Prevent significant changes in the overall species diversity of marine landscapes and water bodies due to human activity.
	Important areas for highly mobile and migratory species <ul style="list-style-type: none"> • spawning/breeding • nursery • migration bottlenecks • calving • feeding • nesting 	2.2 Protect the important areas for aggregations of mobile species (e.g. spawning/breeding, nursery, calving, feeding or resting areas, and migration bottlenecks).
	Species which are threatened by decline or have declined	2.3 Safeguard species which are threatened by decline due to human activity. 2.4 Promote the recovery of species which have declined, to a non-threatened state, where practicable.
3. Maintain populations within bounds of natural variability	Structure among populations <ul style="list-style-type: none"> • metapopulation structure • distribution • habitat availability 	3.1 Protect the structure among populations from significant change due to human activity.
	Structure within populations <ul style="list-style-type: none"> • population size • distribution • habitat availability • age structure 	3.2 Protect the structure within populations from significant change due to human activity.
	Populations at risk	3.3 Protect populations defined to be at risk and recover them to non-at risk state, where practicable.
	Genetic diversity among populations	3.4 Protect the genetic diversity among populations from significant change due to human activity.
	Genetic diversity within populations	3.5 Protect the genetic diversity within populations from significant change due to human activity.

Setting targets for the conservation objectives

307. A process needs to be put in place at government level for setting targets for the marine environment at UK and regional sea scales. This process needs to be at the centre of a strengthened strategic planning framework for the marine environment. It is a critical stage in the integration of strategic goals and sectoral objectives for the marine environment. Stakeholder participation in the process and ownership of the outcomes would be essential.
308. Within the marine spatial planning framework proposed in Chapter 12 of this report, it should be possible to identify those parts of UK waters or the regional seas which will contribute to these targets being achieved, and the contribution which they will need to make. In some cases, the targets will apply to the whole area. In other cases, the targets will apply to specific areas such as a marine landscape or critical areas for a particular habitat or species. This spatial referencing of the agreed targets for the sustainable development of the marine environment, which include those for nature conservation, and of the action necessary to deliver them, is a key benefit of marine spatial planning.
309. To implement the conservation objectives, appropriate targets should be set at the operational conservation objective level. Collectively, these targets should aim to define the nature conservation requirements for the marine environment. To the extent appropriate, they also need to take account of other sectoral objectives and make appropriate contributions towards achieving sustainable development. The application of the principles of the ecosystem approach will be particularly critical in setting these targets.
310. The targets set for the conservation objectives should define what needs to be achieved for marine nature conservation at the UK and Regional Sea scales. They should take account of the existing targets for the marine environment identified under the UK Biodiversity Action Plan process.
311. In contrast to the conservation objectives themselves, the targets are likely to need to be amended in the future. The targets will be based upon what specialists and experts consider appropriate and achievable at the time. As circumstances change, or progress is made, the targets may need to be reviewed. This is particularly the case for those components of the marine environment which lack baseline biological status information.

Conservation objectives for marine protected areas

312. Conservation objectives are already in place for a range of marine protected areas including:
- i. marine Natura 2000 sites designated under the EC Habitats and Birds Directives (candidate Special Areas of Conservation, Special Protection Areas);
 - ii. Marine Nature Reserves, Marine Natural Heritage Areas, Sites of Special Scientific Interest and Areas of Special Scientific Interest;
 - iii. areas protected for other purposes, for example fisheries management, also have objectives which may contribute directly, through protecting fish stocks, or indirectly, through protecting habitats, to marine nature conservation.
313. Examples of such targets may be found in English Nature (2000) and English Nature and Scottish Natural Heritage (2000). These conservation objectives and those set for future marine protected areas should form an integral part of the strategic goals and objectives for the UK marine environment.

Monitoring the achievement of the conservation objectives and targets

314. The progress made towards achieving the targets set will need to be monitored, to assess the effectiveness of measures taken to deliver them. Government should identify which of the conservation objectives and targets should be incorporated for use in national marine monitoring programmes.

Recommendations

R25 The national strategic goals, objectives and targets for the marine environment should form the basis for policy guidance and strategic planning for the marine environment and its sustainable development.

R26 The conservation objectives should be integrated into a single, unified set of national strategic goals and objectives for the marine environment and its sustainable development.

R27 A process should be established to identify and set appropriate targets for each operational conservation objective which are consistent with achieving international and national commitments and strategic goals, including implementation of the ecosystem approach.

R28 The government should identify which of the conservation objectives and targets should be incorporated for use in the national marine monitoring programme.

315. A full report of the work carried out on the conservation objectives is available (Lumb *et al.*, 2004b, and online at www.jncc.gov.uk/irishseapilot).

12. INTEGRATING NATURE CONSERVATION WITH SUSTAINABLE DEVELOPMENT

316. One of the objectives of the Pilot was to assess how the framework for marine nature conservation could contribute to sustainable development in the marine environment. In particular, there was a need to discuss with key stakeholders, how nature conservation objectives and other sectoral objectives could be aligned.
317. During the summer of 2003, the Pilot undertook a wide-ranging consultation on its initial ideas on conservation objectives and invited comments on the approach taken and on how the conservation objectives proposed related to the objectives of the various other marine sectors. This consultation identified a range of important issues which were common to nature conservation and various other sectors, and this information was used to help in the further development of the conservation objectives.
318. In addition to the consultation on conservation objectives, the Pilot undertook similar consultations with respect to the issues of legislation, enforcement and governance during the summer and autumn of 2003. These consultations were followed up by a number of meetings to consider issues of particular relevance to individual sectors.

Comparing sectoral environmental objectives with the conservation objectives

319. From the consultations and discussions held with the range of marine sectors, it has been possible to:
- i. collate a set of broad objectives for the various marine sectors which relate to the environment;
 - ii. identify the dependency of these sector objectives upon the services provided by the marine ecosystem;
 - iii. consider the relationship between these sector objectives and the conservation objectives.
320. For most sectors, there appears to be no single set of agreed objectives. Consequently, the sectoral objectives used in the assessment have been accessed from a variety of sources. The presumption has been made that these sources represent the objectives of the sectors sufficiently well for the purpose of this assessment. The results of the assessment are presented in Table 9 which also references the sources from which the information has been obtained.

Table 9: Sectoral objectives

Sector objectives for the environment relevant to the proposed conservation objectives	Dependency of these sector objectives upon services provided by the marine ecosystem	Interaction of these sector objectives with the proposed conservation objectives
Tourism and recreation¹		
Recreational leisure boating and the development needed to support it should be carried out in harmony with the environment and allow its qualities to be enjoyed by future generations. To support appropriate designations and resist those which would unnecessarily limit or prohibit recreational use of the coast.	Recreational leisure boating requires a clean and healthy marine environment to prosper and be sustainable. Conservation designations aimed at protecting marine ecology and wildlife habitats can play an important role in this. More effective consultation is required with users to ensure that this is achieved.	There should be a high level of common interest in integrating sectoral objectives for the environment with the proposed conservation objectives. The Pilot has trialled the identification of nationally-important marine areas. Where a need is identified to afford such areas an increased level of protection, this should involve participation of affected stakeholders.
To support government initiatives to improve water quality.	People engaging in water contact sports need protection from the risk of illness caused by viruses and other pathogens released into coastal waters and inland waters. Other elements of water quality also need to be addressed.	The Pilot recognises the application of the Water Framework Directive to the seawards limits agreed, and recommends the application of appropriate principles and measures derived from the Water Framework Directive out to jurisdictional limits.
To ensure boating activities are environmentally sound.	Encourage boat users to make sure that their activities do not harm vulnerable habitats or other marine environmental interests.	There should be a high level of common interest in integrating sectoral objectives for the environment with the proposed conservation objectives.
To minimise the adverse impacts of tourism through effective visitor management and the promotion of environmental good practice by tour operators ² .	The coastline and adjoining sea areas have a particularly high conservation value whilst also providing an economic resource for fishing and tourism and leisure activity.	There should be a high level of common interest in integrating sectoral objectives for the environment with the proposed conservation objectives.
Oil & gas³		
To achieve continual improvement in the industry's offshore environmental performance and to develop continually our knowledge of the environmental impact of our operations.	The industry requires access to hydrocarbon and gas fields for prospecting, exploration and production. The industry also needs to construct infrastructure including pipelines. Access to fields and to install infrastructure is dependent upon the ability of the industry to demonstrate that it achieves high levels of environmental performance and minimises the impacts of its operations on the environment.	There should be a high level of common interest in integrating sectoral objectives for the environment with the proposed conservation objectives. The industry is subject to strong environmental protection measures and has a high level of compliance.

¹ Objectives from Draft Royal Yachting Association Planning and Environmental Strategy; British Marine Federation (*pers comm*, Justine Cooper)

² Objectives from Wales Tourist Board and Wales Local Government Association Joint Response to the European Commission consultation: Basic orientations for the sustainability of European tourism 31 July 2003

³ From: The UK Offshore Oil and Gas Industry: Strategy for its Contribution to Sustainable Development 2001.

Table 9 continued

Ports & shipping⁴		
To achieve cleaner seas through MARPOL provision which is compatible with the operational needs of ports and ships.	<p>Shipping requires appropriate access to ports, safe navigation channels and routes, and the sea.</p> <p>Shipping has the potential to impact significantly on environmental services utilised by others. It has a particularly important responsibility to avoid the transfer of non-indigenous organisms by ballast water and sediments, which is one of the greatest threats to biodiversity. Shipping operations also have a need to minimise the risks of chronic or acute pollution from oil and of air pollution. Marine litter, including that originating from vessels, presents a threat to the marine environment and to its recreational and tourism use.</p>	Effective and timely implementation of this sectoral objective is crucial to delivery of the conservation objectives for the physical and chemical properties, for non-native species and for protection of biodiversity.
To promote dredging and disposal methods which are sympathetic to local coastal and estuarial conditions.	There is increasing emphasis on working with rather than against natural coastal processes. The industry is required to consider potential beneficial uses of dredge spoil in applications for disposal licences. Good practice guidance has been developed for dredging and disposal operations.	The sectoral objective is particularly relevant to the objectives set for physical and chemical properties and biodiversity, as well as objectives set to protect habitat availability.
Renewable energy⁵		
To use strategic environmental assessment to guide the pattern and scale of development.	Development of offshore wind resources is fundamentally constrained by environmental factors, e.g. access to areas of seabed within suitable water depths. The industry requires access to sufficient suitable areas of seabed and water column to make an appropriate contribution to meeting the UK's target.	Potential benefits for conservation might occur if the location of wind farms provided effective protection for surrounding areas of seabed which require a high level of protection for conservation (including fisheries) purposes. It is unclear whether this will be an incidental result of the current site selection process; it does not appear to be a material site selection feature, or strategic consideration, currently.
To ensure proper evaluation of impacts through strategic planning and consenting processes, and to provide for monitoring, mitigation and control of individual and cumulative impacts.	<p>The offshore wind industry is a new industry and potential impacts of it upon the marine ecosystem, and the services which the ecosystem provides, are understood with different levels of confidence.</p> <p>Development of windfarm sites is likely to depend upon the industry being able to demonstrate that environmental impacts are within acceptable limits.</p>	In view of the potential extent of development of the offshore windfarm industry, it would be particularly important to ensure that there is a close integration of industry objectives and the objectives proposed by the Pilot. It is also necessary to ensure that interactions between the windfarm industry and other sectors do not constrain the ability to achieve the conservation objective, for example by displacement of activities onto more environmentally sensitive areas.

⁴ From: British Ports Association's Aims and Policies⁵ Objectives from UK Government renewable energy target; DTI (2002) Future Offshore

Table 9 continued

Defence⁶		
MOD aspires to maintain, protect and enhance the nature conservation value of the Defence Estate.	In the marine environment the main requirement of the MOD is for dockyard and berthing facilities, naval exercise areas, low flying areas and for firing and bombing ranges.	The set of conservation objectives proposed by the Pilot provide guidance on what needs to be achieved on marine Defence Estate.
Ensure that integrated management plans, supported as necessary by environmental steering groups, are used to implement our specific objectives.	Uses are site dependent.	The integrated management plans would provide an appropriate mechanism for the integration of conservation objectives into spatial planning and management at the local scale.
Use of private and public land will seek to avoid disruption to nature conservation, cultural heritage, and the landscape, and will take account of the potential competing interests of other non-military users.	The main uses of the marine environment by the MOD require access to specific areas (open or restricted to the public) permanently or temporarily.	The conservation objectives will inform this sectoral objective.
Mariculture⁷		
To identify the species and methods best suited to particular areas.	Mariculture is the sector with one of the highest dependencies upon a naturally functioning, productive and high quality marine environment. It relies strongly upon sustaining the physical and chemical properties and avoiding significant disturbance to the foodweb and biodiversity. Significant disturbance to any of these has potential for detrimental impact upon the mariculture operations. Site selection is important.	There should be a high level of common interest in integrating sectoral objectives for the environment with the proposed conservation objectives. The conservation objectives should inform consideration of potential areas for mariculture, by identifying their conservation requirements.
To identify what scope exists for the expansion of shellfish cultivation. To identify potential ecosystem effects from increasing the biomass of shellfish in certain areas. To find out if specific sites have a finite carrying capacity in terms of the ability of an area's natural productivity to support growth.	Increasing the scale of mariculture operations increases the risk of significant disturbance to the ecosystem and impact upon the mariculture operations.	The Pilot proposes conservation objectives which aim to maintain or, where necessary, recover ecosystem components which may be affected by activities such as mariculture. These include objectives for trophic status, trophic level balance, water bodies and biodiversity. There should be a high level of common interest in minimising ecosystem effects.
Marine aggregates⁸		
The Government wishes to see the continued use of marine dredged sand and gravel to the extent that this remains consistent with the principles of sustainable development. To achieve this, the dredging industry requires sufficient access to suitable long-term resources to meet its varied and fluctuating markets and to provide it with sufficient confidence to invest in new ships and wharves.	The industry requires long-term environmentally sustainable access to commercially viable areas of marine aggregates.	The conservation objectives should inform assessments of the environmental sustainability of exploitation of particular aggregate deposits. There will be a need to ensure that individually, and cumulatively with other sectors, the marine aggregate extraction does not prevent the achievement of the conservation objectives.
At the same time, it is important that dredging activities do not significantly harm the environment or fisheries or unacceptably affect other legitimate uses of the sea.	Measures put in place by the industry and regulators aim to reduce the footprint and impact of aggregate extraction on the environment and other users. Aggregate extraction has the potential to affect services provided to other sectors e.g. fisheries.	There should be a high level of common interest in integrating this sectoral objective for the environment with the proposed conservation objectives.

⁶ Objectives from MOD 2000. The Strategy for the Defence Estate

⁷ Objectives from DARDNI 2001. The Shellfish Aquaculture Management Plan for Northern Ireland

⁸ Objectives from Office of the Deputy Prime Minister (2002) Marine Mineral Guidance 1 : extraction by dredging from the English seabed

Table 9 continued

Fisheries⁹		
Protect and conserve marine resources, Rational exploitation on a sustainable basis.	Fisheries are highly dependent upon access to the marine environment and to stocks of fish to harvest. Currently many stocks are heavily fished or overfished. Many stocks are outside, or almost outside, of safe biological limits. Key cod stocks are on the verge of collapse	There is a common interest in ensuring that exploitation of fish stocks is managed to optimise long-term environmentally-sustainable yields. Integration of fisheries and nature conservation objectives is crucial to the achievement of both. The conservation objectives include objectives for the protection and recovery of foodwebs, including the stocks of commercially-exploited fish.
Take account of implications for marine ecosystems. Integrate environmental protection requirements.	Fisheries are also responsible for some of the most significant of human impacts upon the marine ecosystem, not just on target fish stocks.	There is an urgent need to integrate environmental protection requirements into fisheries. Fisheries collectively have the potential for a negative impact upon most of the proposed conservation objectives. Certain fisheries conservation measures, particularly those controlling the use of mobile bottom gear in areas, have the potential for wider benefits to nature conservation. The conservation objectives provide a framework which could guide this integration.
Shellfisheries¹⁰		
Achieve 'A' classification status for all shellfish waters; reduce other forms of pollution.	The shellfish industry requires high water quality coastal waters to improve shellfish hygiene, to permit harvesting of shellfish (mussels, cockles etc) from unclassified or Class 'C' beds and to avoid or minimise purification requirements for harvested shellfish. (This objective is relevant also to mariculture).	This sectoral objective is consistent with the achievement of the proposed water quality objectives.
Sustainable commercial shellfisheries within 0-12nm and beyond 12nm.	The sector requires access to sustainably exploited stocks of shellfish.	The industry needs to protect stocks of shellfish at, or where necessary recover them to, levels at which they can be sustainably and optimally exploited. There should be a high level of common interest in integrating sectoral objectives for the environment with the proposed conservation objectives

⁹ Objectives from UK Fisheries Industry - Current Situation Analysis. Number 10 Strategy Unit: Evaluation of the CFP, Source EC.

¹⁰ Objectives from Shellfish Association of Great Britain response to Number 10 Strategy Unit consultation on the UK Fisheries Industry

321. Table 9 does not include a catalogue of the socio-economic objectives for each sector. Although socio-economic issues are outlined in Chapter 6 on the Regional Sea, the identification of socio-economic objectives was outside the scope of the Pilot. In order to develop a Sustainable Development Strategy for the Irish Sea, however, these socio-economic objectives would need to be identified.
322. In the light of the foregoing, the Pilot has made a preliminary assessment of the likely relative importance, now and in the future, of each of the operational conservation objectives for the sustainable development of each of the key marine human use sectors.
323. This assessment has been done by taking each operational conservation objective and subjectively scoring, against each of the major sectors, the potential importance which achieving the conservation objective might make to helping to achieve the sustainable development of that sector. Three broad categories of relationship are identified, which are not mutually exclusive:
- i. where the sector has generally low negative impacts upon the marine ecosystem but depends upon a high quality environment, e.g. recreation;
 - ii. where the sector has potential for substantial negative impact on the marine ecosystem but achievement of the conservation objectives has potential substantial social and economic benefits for the sector, e.g. recovery and sustainable exploitation of fish stocks is of high mutual interest to fisheries and nature conservation sectors;
 - iii. where the compliance with the conservation objectives (high environmental standards) may be required to achieve regulatory approval, e.g. in the oil and gas sector.

The following categories of assessment are used:

-  High: the implementation of, or compliance with, an operational objective similar to this may be of major importance to the sustainable development of the sector.
-  Moderate: the implementation of, or compliance with, an operational objective similar to this may significantly enhance the sustainable development of the sector.
-  Low: an operational objective similar to this is unlikely to make a significant contribution to the sustainable development of the sector.

The results of the preliminary assessment are presented in Table 10.

Table 10: Assessment of importance of conservation objectives for sustainable development in the various marine sectors

Objective number	Operational conservation objective	Aggregates	Coast development	Dredging & disposal	Energy	Fisheries (mobile gear)	Fisheries (static gear)	Mariculture	Military	Recreation	Shipping
Aim 1: Physical & chemical											
1.1	Protect coastal processes										
1.2	Protect seabed habitats										
1.3	Protect biogenic structures										
2.1	Protect water bodies										
3.1	Protect water quality										
3.2	Chemical pollutants										
3.3	Oil										
3.4	Oil spills										
3.5	Noise & vibration										
3.6	Marine litter										
4.1	Contaminants										
Aim 2: Productivity											
1.1	Trophic status										
2.1	Harvest										
2.2	Protect habitats										
2.3	Protect prey populations										
2.4	Protect predator populations										
3.1	Protect population longevity										
3.2	Protect population life history										
3.3	Recover spawning stock										
3.4	Ecologically sustainable fishery										
3.5	Reduce fishing mortality										
3.6	Ecologically sustainable fishery										
Aim 3: Biodiversity											
1.1	Trophic level balance										
1.2	Protect habitat complexity										
1.3	Maintain best areas										
1.4	Protect rare habitats										
1.5	Protect threatened habitats										
1.6	Recover declined habitats										
1.7	Protect against non-native species										
1.8	Reduce impacts of non-native species										
2.1	Protect species diversity										
2.2	Protect important areas										
2.3	Safeguard species										
2.4	Recover declined species										
3.1	Protect population structure										
3.2	Protect population structure										
3.3	Protect populations at risk										
3.4	Protect genetic diversity										
3.5	Protect genetic diversity										

Achieving the conservation objectives within the context of sustainable development

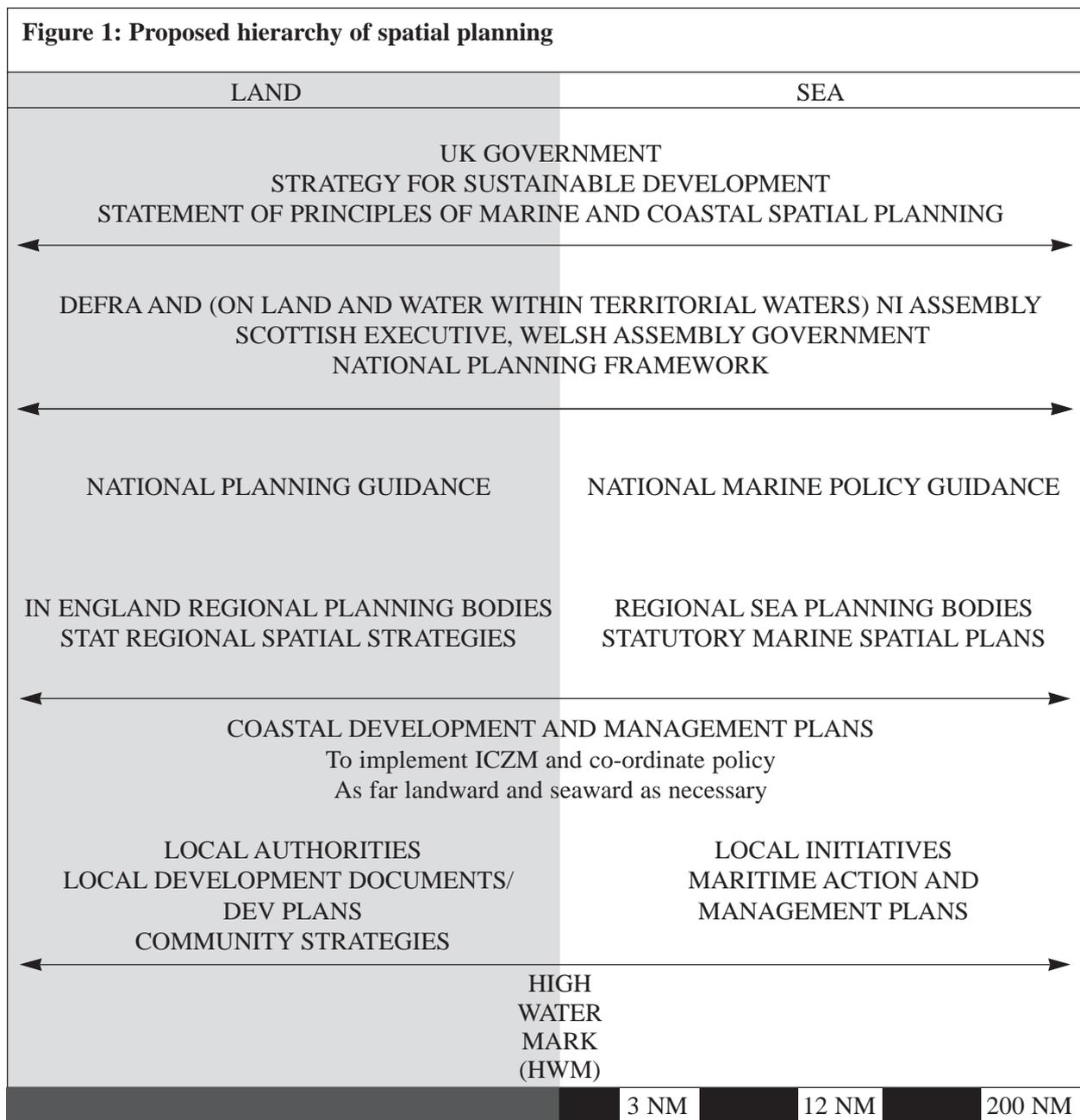
324. Following consideration of the relationship between the conservation objectives and the environmental objectives of the various marine sectors, the Pilot considered the need to regulate human activity in relation to the Irish Sea within the sustainable development context. The Pilot addressed this issue in terms of:
- i. the overall context of strategic planning and the sustainable use of the Irish Sea;
 - ii. action needed to conserve nationally-important areas;
 - iii. action needed to conserve certain mobile nationally-important species;
 - iv. cross-cutting and sectoral action to achieve the conservation objectives and in support of the foregoing.

Strategic planning and sustainable use

325. The UK land-based planning process combines national and regional policy guidance with detailed local plans. These plans combine the adoption of principles and presumptions, which guide decision-taking, with land use zoning. The plans are not comprehensive, being focused on the control of development. Key sectoral issues which lie, at least partly, outside this planning process are agriculture, forestry and water management; this constrains the degree to which strategic development planning can act also as land use planning.
326. This planning process does not apply in the marine environment beyond the immediate coast. In the marine environment, planning processes have developed in some sectors, e.g. in oil and gas exploration and production, but, while such plans have regard to the need to avoid impacts on other sectors, planning is not integrated across sectors.
327. In the United Kingdom, there is no statutory process of integrated Coastal Zone Management. In 1992, the House of Commons Environment Select Committee report on coastal zone protection and planning recommended inter alia, 'a central unit to adopt a national overview of coastal zone policy' be established (House of Commons Select Committee on the Environment, 1992). A number of non-statutory coastal zone management initiatives were pursued during the 1990s in both Britain and Ireland, and appropriate methods for such planning and management were developed (e.g. English Nature, 1993; Department of the Environment, 1996); but the non-statutory status of these initiatives was a weakness. On 30 May 2002, the European Union adopted its Communication on implementing Integrated Coastal Zone Management in Europe (European Commission, 2002), which commends Member States to undertake a 'stocktake' of legislation, institutions and stakeholders in coastal zone management, and to develop national strategies to deliver Integrated Coastal Zone Management. The UK Government is currently undertaking the 'Integrated Coastal Zone Management UK Stocktake' in response to the EU Communication.
328. There are a number of constraints on integrated strategic planning. These include:
- i. the fact that some decisions have been ceded to an international regulator, for example shipping, fisheries and the laying of cables. The practices of such regulators can only be changed by international agreement;
 - ii. the inherent resistance of sectoral regulators to cede authority for decision-taking to another regulator; such resistance may, and sometimes may not, be in accord with the wider public interest;

- iii. practical experience of integrated marine planning is limited in both the UK and neighbouring countries; such experience is generally limited to the coastal zone.
329. Current ideas on strategic planning in the marine environment can be summarised broadly as either:
- i. improved, and more sophisticated, sectoral planning with enhanced integration of planning between sectors; or,
 - ii. more fully co-ordinated cross-sectoral planning which covers, and seeks to integrate, all the main sea uses.
330. To be fully effective, such strategic planning should include all the main marine sectors, and, for the reasons given earlier, this may depend on achieving international agreement for some sectors.
331. The starting point in marine strategic planning in the UK should be the strategic goals set out in *Seas of Change* (Defra 2002b). It is anticipated that the fundamental assumption underpinning strategic planning would be that the performance of all marine sectors would be assessed against these goals.
332. The Pilot commissioned David Tyldesley and Associates, in association with W.S. Atkins, to review the issue of coastal and marine spatial planning and to identify good practice principles. The contract report (David Tyldesley and Associates, 2004) sets out a number of guiding principles. These are:
- i. marine spatial planning should be introduced as a statutory process embracing both plan making and regulatory controls. It should require all competent authorities to apply the precautionary principle, and also the principle that, where there is a conflict of interest, the conservation (and restoration) of the sea's biodiversity and natural physical and ecological systems should prevail;
 - ii. marine spatial planning should cover all forms of physical and spatial development, changes of use and all ongoing or proposed activities, seaward out to 200n miles within the UK's marine competency;
 - iii. marine spatial planning should operate at the national and Regional Sea levels, and where appropriate also at the more detailed local level; furthermore, jurisdictional competency in the intertidal zone should be rationalised to avoid duplication.
333. The report suggests that these guiding principles would be supported in practice by a hierarchy of plans, including:
- i. a Marine and Coastal Planning Policy Statement which provides a UK expression of national marine planning principles for the seas within the national competency;
 - ii. policy statements in a National Planning Framework for England, Scotland, Wales and Northern Ireland following the vision and strategic goals developed in *Safeguarding our Seas* and subsequently;
 - iii. statutory marine spatial plans for each Regional Sea;
 - iv. where necessary, statutory local Maritime/Coastal/Coastal Area Action Plans.

This hierarchy is shown diagrammatically in Figure 1.



334. Referring to the options summarised in paragraph 329 above, there is a need for a considerable degree of functional planning integration to be achieved across the sectors. This needs to go beyond individual sector plans developed in consultation with other sectors, to a system which ensures strong co-ordination of such spatial planning and a high level of cross-compliance.

335. The report by David Tyldesley and Associates recognises that integrated Marine Spatial Planning is novel in operational terms, both for the UK and for neighbouring countries, and that a trial to develop the concepts to the stage where they can be implemented in practice needs to be undertaken prior to their adoption. The report recommends that such a trial be undertaken for the Irish Sea. This proposal is discussed further in Chapter 18.

336. The marine nature conservation framework can help to achieve the strategic goals through contributing to strategic planning and the appropriate regulation of human activity. This contribution is considered below in relation to i) zoning, and ii) strategic environmental assessment.

Zoning

337. Strategic planning would seek to meet the local, regional and national needs of the environment, economy and society, and deliver the strategic goals for the marine environment, in part through a system of spatial planning which incorporates zoning. The area of the Regional Sea would be sub-divided into zones which identify the types of human activity appropriate to them. These zones would take account both of economic and social needs, and also the requirement for environmental protection. The framework for marine nature conservation would contribute to this zonation in two main ways, namely:
- i. via the map of marine landscapes scored so as to indicate their susceptibility to harm across the range of human activities;
 - ii. via the map indicating the ecologically-coherent network of nationally-important areas.
338. While this zoning has value for generalised planning purposes, in practice the zoning pattern is likely to vary in relation to the individual marine sectors; for example fragile seabed communities will be less susceptible to harm from the passage of surface vessels than from dredging, bottom trawling or sediment disposal activities. It would be advantageous, therefore, to zone in relation to the main types of human activity impact and/or in relation to each activity sector. Such zoning information can then be taken into account by the individual sectors in the planning of their future operations.
339. All available information should be taken into account in relation to zoning. There will usually be more detailed biological information available for inshore areas than for offshore areas, and inshore areas are likely to come under greater human pressure. As a consequence, planning is likely to be more detailed for inshore areas. This will allow account to be taken of important habitat features (e.g. biogenic reefs, eelgrass beds, maerl beds etc), as well as the larger-scale marine landscapes.

Strategic Environmental Assessment

340. Strategic and spatial planning of the marine environment could potentially make full implementation of the Strategic Environmental Assessment Directive (due in July 2004) easier, more effective for regulators and less onerous for users. Any regulatory framework of planning which attempts to identify environmental interests and zone sectoral activities should be harmonised with the Strategic Environmental Assessment Regulations. Used in combination, these processes should ensure that the best decisions are reached from the perspective of sustainable development. Together, spatial planning and Strategic Environmental Assessment would identify the range of environmental interests and activities that any new development would have to take account of, and help in the selection of areas where impacts would be minimised. As more sectors engage in Strategic Environmental Assessment, the value of setting standards, sharing information between sectors, and integrating Strategic Environmental Assessment across sectors will increase. Specific guidance on the implementation of Strategic Environmental Assessment in the marine environment, in addition to the general guidance issued and planned by the Office of the Deputy Prime Minister, is required to ensure the maximum benefits are obtained from implementation of the Directive.

Conclusion

341. An integrated, ecosystem-based marine spatial planning framework is required to manage the resources of the sea strategically. The Regional Sea is an appropriate scale at which to undertake marine spatial planning, and the marine landscape classification provides a framework for the development of locally-tailored planning and management policies. In the Irish Sea, and other

Regional Seas, an ecosystem approach requires considerable international co-operation as well as the inclusion of social and economic aspects of sustainable development. The approach developed by the Pilot offers a model and some experience on which to build. In almost all UK Regional Seas as identified by the JNCC (Map 8), some international consensus would be required to progress management and spatial planning. Co-ordination between strategies at the EU level is critical. Both the CFP and the developing EU marine strategy must be consistent with, and contribute to, the overarching spatial planning framework.

Conserving important marine areas

342. Chapters 8-10 confirm that the effective conservation of an ecologically-coherent network of nationally-important areas is a critical component of any strategy for marine nature conservation. In addition to this essential strategic element, there are a number of key drivers for the establishment of networks of marine protected areas. These are:
- i. the requirement to establish Special Areas of Conservation and Special Protection Areas within the Natura 2000 network out to 200n miles;
 - ii. the agreement reached in June 2003 under OSPAR to establish an ecologically-coherent network of well managed marine protected areas for the OSPAR maritime area by 2010;
 - iii. the commitment made at the World Summit on Sustainable Development in September 2002 to establish representative networks of marine protected areas by 2012 (United Nations, 2002).
343. The agreement reached under OSPAR is intended to lead to the establishment by 2010, of an ecologically-coherent network of well managed marine protected areas which will:
- i. protect and conserve areas that best represent the range of species, habitats and ecological processes in the maritime area;
 - ii. protect, conserve and restore species, habitats and ecological processes which have been adversely affected by human activities;
 - iii. prevent degradation of, and damage to, species, habitats and ecological processes, following the precautionary approach.
344. Past and current work to designate, establish and conserve coastal and intertidal Sites of Special Scientific Interest, Areas of Special Scientific Interest, Wildlife Refuges, nature reserves, and also coastal and marine Natura 2000 sites, will make an important contribution towards meeting the needs referred to in paragraphs 342-343 above. However, only the series of Natura 2000 sites extends below low water mark, and while it will make a substantial contribution to, it will not achieve, the establishment of the ecologically-coherent network required under OSPAR without a comprehensive revision of its Annexes. The Habitats Directive currently lists 7 habitats on Annex 1, while, as has been shown in Chapter 7, an objective analysis of the coastal and seabed habitats (marine landscapes) of the Irish Sea identified 18 such habitats. The number of marine landscapes for the UK and adjacent waters is likely to be significantly greater, perhaps 20-30.
345. In contrast, the development of the ecologically-coherent network of nationally-important areas considered in Chapter 9 will meet the OSPAR and Natura 2000 objectives, provided the network is adequately conserved.
346. An ecologically-coherent network will consist of some areas where the nature conservation value lies in specific interest features (gas seep structures, bottle-nose dolphin populations, black scoter

- assemblages etc). For these, the conservation action required is to perpetuate these specific features. This approach to area conservation is that followed with respect to many Natura 2000 sites. Critics of this selective approach to area conservation point to two perceived weaknesses. Firstly, it assumes that the ecological relationships which exist within a site, and between the sites and adjacent areas, are understood. Unfortunately, this may not be the case; it is now known that many mobile species utilise different habitats in different seasons and even at different times of the day and night. Secondly, it assumes that the state of the site at the time of selection is the desired state, when, quite possibly, parts of the site are already well below their ecological potential because of past and present human use.
347. In addition to specific interest features, many areas within the ecologically-coherent network will be selected for the contribution they will make to a wider range of biodiversity. Primarily, these are the areas selected as being examples of a representative series of marine habitats. For these areas, it is important that the area is managed so as to enable it to support the range of species and communities characteristic of that habitat type. To achieve this, it would be necessary to exclude activities likely to cause physical damage or disturbance to the habitat, and also activities which would limit the population size of its constituent species. Consequently, there would be a presumption against activities such as dredging or commercial fishing on such sites. However, because areas are selected as representative examples of the various types, there is considerable flexibility over the selection of specific areas, and this provides potential for selection to adjust to sectoral and economic interests.
348. A network of marine protected areas is an integral part of the zoning concept of spatial planning referred to above. Effectively, such areas will be included within the zones where human activity is to be carefully managed.
349. Voluntary approaches to the establishment of marine protected areas have been only partly successful when this approach has been tried in various countries. Voluntary approaches have often been the result of local initiatives; more rarely have they been pursued on the basis of a systematic nationwide effort. Where voluntary approaches have been successful, the success achieved has tended to be partial, temporary, or the precursor to statutory action (Roberts *et al.*, 2003).
350. The approach taken by the UK in relation to Natura 2000 sites in the marine environment is to utilise the range of powers already available to marine regulators; supplementing these powers as necessary. This approach is dependent on the use of these powers being obligatory (both in establishing the protected areas, and in regulating human activity), subject to issues of overriding national public interest. In contrast, a similar approach taken to establish and conserve marine nature reserves during the 1980s and 90s, which was not subject to the obligatory use of such powers, failed.
351. A disadvantage of the 'Natura 2000' approach is its 'multiple-stop shop' approach to area management, where different regulators are responsible for regulating different types of human activity on a site in order to achieve the conservation objectives. This could lead to complexity and duplication of action, since a proposed activity might require several different approvals. In practice, the problem is addressed in part through guidance provided to regulators, and in part through the preparation of a Management Scheme for each marine site.
352. Finally, a fully integrated approach could be taken which provides for both a specific statutory measure to establish marine protected areas, and also comprehensive measures for the area's conservation and management. This has the potential benefit of identifying a lead responsibility for the establishment and management of the area, and creating a 'one-stop shop' for decision-taking.

353. In conclusion, measures taken to establish and conserve an ecologically-coherent network of nationally-important areas need to have the following characteristics:
- i. result in the establishment of the network over a 5-10 year timeframe (in order to halt the decline in biodiversity and to meet international obligations);
 - ii. ensure that the conservation objectives for the areas are met; these objectives will vary from ensuring the conservation of specific interest features to ensuring the area achieves its full biodiversity potential;
 - iii. ensure that measures taken to achieve the conservation objectives are as cost-effective and efficient as possible, both from the viewpoint of the regulator(s) and from that of the human activity sectors. Simplicity is to be preferred to complexity.

Conservation of certain mobile nationally-important species

354. Existing wildlife protection legislation, both domestic legislation and also that required by the Birds and Habitats Directives, is intended to provide protection to those species likely to be endangered as a result of persecution or exploitation. For birds, this protection is extended to all species.
355. A major cause of mortality of a number of nationally-important species in the marine environment is, however, injury and killing which is the incidental result of other operations, most notably fishing. Such mortality is of particular concern in relation to a range of species of small cetaceans, including harbour porpoise and several species of dolphins, but is potentially a factor in relation to a range of species, including sea turtles, sharks and seabirds. Research to identify technical measures to reduce such mortality should be a priority and, where a satisfactory technical measure (or measures) exists, its use should be compulsory.
356. Some mobile species, e.g. skates, rays and sharks, are deliberately targeted by capture fisheries, both commercial fishing and sea angling. Elasmobranchs cannot sustain other than a very low fishing pressure, and the sustainability of these pressures should be scrutinised closely. With regard to declining elasmobranch species, there should be a requirement for incidental captures to be returned to the sea.

Cross-cutting and sectoral action

357. In addition to, and in support of, the foregoing measures, cross-cutting and sectoral action should be taken. Having regard to the assessment summarised in Table 8, and in the light of conclusions reached with regard to measures reported above, the Pilot has set out the key management measures needed to deliver the proposed operational conservation objectives, and the national and international targets for marine nature conservation and sustainable development, in Table 11. This list of actions is not comprehensive, and some of the actions specified are already ongoing.

Table 11: Management mechanisms and measures needed to deliver the conservation objectives for the Irish Sea

Key mechanisms and measures	Relevant Operational Objectives	Comments
Strategic planning and sustainable use		
1.1 An integrated and effective marine spatial planning and management system in place, incorporating zoning of marine uses, over the UK territorial waters and adjacent regional seas.	All objectives	<ul style="list-style-type: none"> • More integrated and effective marine spatial planning is critical to deliver improved regulation, management and protection of the marine environment that addresses the multiple, cumulative and potentially conflicting uses of the sea. Likely to be based upon new legislation, duties and powers.
1.2 All developments, proposed changes and activities brought within the scope of a marine spatial planning system. Fisheries are a critical area for inclusion.	All objectives	<ul style="list-style-type: none"> • It is inappropriate that some activities, most notably fisheries, fall largely outside of current spatial planning and regulatory systems when their environmental impacts may approach or exceed those within the systems. • This is recognised on land now, with agriculture and forestry increasingly being brought within land use planning.
1.3 Conservation objectives integrated with other objectives for sustainable development and delivered through this improved marine spatial planning system.	All objectives	<ul style="list-style-type: none"> • Within the UK, the Marine Stewardship process needs to ensure the integration and delivery of conservation and sustainable development objectives, in pursuit of the vision and strategic goals for the environment. Ecosystem approach principles should guide this integration. These objectives will in turn drive marine spatial planning and plans.
1.4 Planners and regulators with appropriate responsibilities, powers and tools to enable them to promote, ensure and enable the conservation and sustainable development of the marine ecosystem.	All objectives	<ul style="list-style-type: none"> • As part of the improvement of the marine spatial planning system it would be appropriate and necessary to review the responsibilities, powers and tools placed upon or available to planners and regulators.
1.5 Strategic Environmental Assessment (and Sustainability Assessment) undertaken for all marine sectors. Include coastal and marine fisheries.	All objectives	<ul style="list-style-type: none"> • This relates to the requirements outlined in the European SEA Directive (2001/42/EC) and being transposed into national legislation. Sectoral SEAs are being undertaken by DTI for offshore energy. SEA would feed into an improved marine spatial planning framework. • SEA should be undertaken for the fisheries sector.
1.6 Developments and activities which have the potential for a significant impact upon the marine ecosystem be subjected to Environmental Assessment.	All objectives	<ul style="list-style-type: none"> • Most sectors and significant developments in the marine environment are already subject to environmental assessment, e.g. coastal development, oil and gas development, capital dredging. • The fisheries sector, which is responsible for some of the most significant impacts upon the marine ecosystem, is generally not subject to environmental assessment. • Ongoing and proposed changes in fisheries activities could be regulated and practiced through fisheries.
1.7 Water quality objectives for transitional and coastal water bodies taken forward primarily through the Water Framework Directive and appropriate measures taken for waters to seawards.	Water quality objectives -2.2.1, 2.3.1-2.3.6 & 2.4.1	<ul style="list-style-type: none"> • This is currently being implemented by European states. • Adoption of equivalent measures in Crown Dependencies may be necessary. • The Water Framework Directive includes some principles and approaches which it may be appropriate to consider applying to the marine water bodies (and indeed the marine environment as a whole). • These objectives need to inform consideration of the ecological carrying capacities of enclosed or semi-enclosed water bodies (e.g. sea lochs, rias, estuaries, saline lagoons) for mariculture and similar operations.

Table 11: continued

Conservation of important marine areas			
2.1	Completion of the UK marine Natura series out to 200nm and UKCS where appropriate.	All objectives	<ul style="list-style-type: none"> Being undertaken in the UK by Defra/JNCC/country conservation agencies (within 12 miles) for existing Annex I and II habitats and species. This will consider both the overall extent of the current four 'offshore' Annex I habitats which should be included within Natura 2000 and the specific sites.
2.2	Completion of an ecologically-coherent national network of marine protected areas within the UK which includes Natura and additional marine protected areas as necessary and makes an appropriate contribution to the protection, conservation and recovery of the marine ecosystem.	All objectives	<ul style="list-style-type: none"> Draft criteria have been developed and trialled by JNCC through the Irish Sea Pilot. The contribution which current and proposed Natura 2000 would make to forming this core, and the possible implications for the management of these Natura 2000 sites needs to be evaluated. The management measures required for these areas needs to be fully assessed. A proportion will already be within protected sites and subject to appropriate management.
2.3	European marine site conservation objectives, management schemes and outcomes reviewed against national and regional sea conservation and sustainable development objectives and requirements and revised as necessary.	All objectives	<ul style="list-style-type: none"> There would be a need to ensure that European marine sites are making the most appropriate contribution to meeting national and regional sea objectives and targets for their designated interests. <p>Conservation of certain mobile nationally-important species.</p>
Conservation of certain mobile nationally-important species			
3	Strengthened legal measures to protect and to promote the recovery of certain vulnerable marine species.	Foodweb – 2. & 3; biodiversity – all.	<ul style="list-style-type: none"> Existing species measures fall short of what is required to meet their conservation needs. These include the need to strengthen protection against incidental damage and to take measures to promote the recovery of vulnerable species which have declined.
Sectoral measures			
Sea fisheries			
4	Measures available and implemented effectively to reduce the harmful impacts of fisheries.	Seabed features - 1.1.2 & 1.1.3; water quality 3.3.1; marine foodwebs - all; biodiversity – all.	<ul style="list-style-type: none"> The harmful effects of bottom-towed fishing gears on seabed habitats need to be reduced or, where necessary, removed. Bottom-towed fishing gears are responsible for some of the most significant impacts upon parts of the marine ecosystem. Promotion of alternative, sustainable fisheries methods which avoid the use of gear which damages or disturbs the seabed. Further measures need to be taken to reduce the impacts of fisheries on marine foodwebs and biodiversity, including the recovery of target species stocks and protection of non-target species. There may need to be a significant shift from a focus on improving the catching efficiency of fishing gears to improving their environmental sustainability.
Mariculture			
5.	Sustainable development strategies developed and implemented for mariculture, which are integrated with other uses of the marine environment and ensure its conservation.	Physical features - all; marine foodwebs – 2.2.2; biodiversity – all.	<ul style="list-style-type: none"> Mariculture requires a high quality environment in which to operate and yet has the potential to cause significant environmental change, for example where operations are undertaken at inappropriate locations or scales. Mariculture operations can directly and indirectly affect a wide range of uses of the marine environment
Shipping and navigation			
6.	Effective measures in place to increase shipping safety and reduce the risk of environmental pollution from shipping accidents.	Non-native species - 3.1.7 & 3.1.8	<ul style="list-style-type: none"> Transfer of non-indigenous organisms by ballast water and sediments is one of the greatest threats to marine biodiversity.

358. The following recommendation is made in relation to strategic and spatial planning. Recommendations on the other issues discussed in this Chapter are given in Chapter 13 on Legislation.

Recommendations

R29 Effective mechanisms are needed to implement marine spatial planning out to 200n miles. Mechanisms should include:

- i. the introduction of marine spatial planning as a statutory process involving national planning guidelines, strategic plans at Regional Sea level and more detailed local plans;**
- ii. marine spatial planning should cover development and other sectoral activities both current and proposed;**
- iii. marine spatial planning should adopt an ecosystem approach and seek to implement conservation and other sustainable development objectives;**
- iv. placing duties on public bodies to carry out their functions in accordance with the principles of sustainable development and to further the achievement of the conservation objectives included in the plans;**
- v. consensus should be built internationally to develop effective planning and management policies at the Regional Sea scale.**

13. LEGISLATION - ASSESSMENT OF CURRENT STATE AND FUTURE NEEDS

359. Following the trial of the draft framework for marine conservation, the Pilot was required to consider the extent to which the framework could be delivered in the UK through existing systems of regulation, and what additional measures might be needed.

Methods

360. The Pilot employed three methods to assess the effectiveness of existing legislation in meeting the needs identified in the draft framework for marine nature conservation, namely:

- i. a review of existing legal mechanisms that apply in the Irish Sea was commissioned from the Institute of Estuarine and Coastal Studies at the University of Hull;
- ii. consultations were undertaken with Irish Sea stakeholders;
- iii. the Pilot's conservation objectives for the Irish Sea, and the management actions developed from them, were tested against existing legal mechanisms.

The Pilot also participated in the work of the subgroup on legislative mechanisms established by the Review of Marine Nature Conservation.

361. The Institute of Estuarine and Coastal Studies review produced 2 reports which summarised the relevant current legislation (Boyes *et al.*, 2003a) and the current governance and enforcement regimes (Boyes *et al.*, 2003b). The Institute also drew attention to what, in its view, were existing gaps and shortcomings in the legislation.

362. The Pilot undertook a similar review of the Isle of Man governance framework, through a contract jointly funded by the Isle of Man Government, with the Centre for Marine and Coastal Studies, University of Liverpool. The reports of this work are available from the Isle of Man Government, but the Pilot is not making recommendations in relation to legislation in the Isle of Man.

363. Sectoral interests were consulted to identify their main concerns and possible solutions. Responses to the two reports were invited from Irish Sea stakeholders, Government Departments and other bodies. The views received have been used to inform the development of recommendations.

Conclusions

364. The main issues identified during the course of the above work were the need for:

- i. effective legislation for the establishment and conservation of a network of nationally-important marine areas;
- ii. effective species protection legislation;
- iii. effective means of controlling the introduction and spread of (potentially) invasive non-native species;
- iv. the need for effective means of ensuring that the human use of the marine landscapes enabled them to maintain their characteristic biological communities and wildlife populations.

365. The existing legislation relating to marine nature conservation in the United Kingdom is summarised on www.jncc.gov.uk to which reference may be made. This information is repeated

below only insofar as is required to provide the necessary context. The Pilot has followed a number of principles in developing its conclusions and recommendations, these are:

- i. recommendations should address a real need and have the potential to deliver a significant nature conservation benefit;
- ii. measures taken should be effective and, to the extent practicable, easy to understand and straightforward to operate;
- iii. overlapping legislation should be avoided where possible;
- iv. measures taken should be in the public interest and have a large measure of public support;
- v. measures should comply with international obligations.

366. In this chapter, nature conservation legislation is considered first, followed by issues relevant to the regulation of development and other sectoral activities which have an impact on marine nature conservation.

Nature conservation legislation

Protection of marine areas

367. The need for an ecologically-coherent network of important marine areas is considered in Chapters 9 and 10, and the measures required to support the conservation of that network in Chapter 12. Of the available existing legislative provisions, three require specific attention; these are i) Sites of Special Scientific Interest/Areas of Special Scientific Interest, ii) Marine Nature Reserves, and iii) European Marine Sites (Special Areas of Conservation and Special Protection Areas). Of these, only the last two can be applied with any certainty below low water mark.

Sites of Special Scientific Interest/Areas of Special Scientific Interest

368. These designations can be applied down to low water mark. Beyond low water mark there is a large measure of uncertainty about the circumstances under which it may be possible to apply them. In England, Wales and Northern Ireland, the protection afforded by these designations has been strengthened, and prospective legislation to accomplish similar improvement is underway in Scotland. The legislation is based on legal obligations placed on owners and occupiers of land (including land covered by water), on planning authorities and on other public bodies. There are also provisions regulating the activities of other persons. In general, these provisions are likely to achieve the conservation needs of nationally-important marine areas in the intertidal zone. However, the lack of legal clarity about the area over which they can be applied is unsatisfactory for such an important conservation mechanism, and it is in the public interest that this uncertainty be resolved through a legal clarification. Options would include specifying the limit as being low water mark (mean low water springs in Scotland), or down to 6 metres depth at mean low water to help overcome the problems associated with dynamic intertidal landforms, and to assist compliance with the Ramsar Convention.

Marine Nature Reserves

369. The Marine Nature Reserve legislation has been in place in Great Britain since 1981, but, to date, only two reserves have been established and only for one of these has full protection been achieved. Comparable legislation in Northern Ireland has resulted in the establishment of one reserve, and only partial protection has been achieved for that reserve. As a mechanism for achieving marine site conservation, this legislation has failed. The reasons for this failure have

been reviewed in a number of accounts (e.g. Jones, 1999), but in the opinion of the Pilot, the fundamental weakness in the legislation was that neither the establishment of a network of reserves, nor the use of the available powers to protect and conserve them, was obligatory. Sectoral resistance to their establishment overcame what, in practice, was simply an enabling power. The lessons from this experience need to be learned.

European Marine Sites

370. The Conservation (Natural Habitats, &c) Regulations 1994, and the prospective Regulations for implementing the Birds and Habitats Directives out to 200n miles, are expected to meet the majority of the site-related requirements of the Directives. However, the Habitats Directive currently only lists 7 marine habitats types on Annex 1 as requiring designation as Special Areas of Conservation, while the Pilot has identified 18 marine landscapes for the Irish Sea, and the number of marine landscapes for the UK and adjacent sea areas is likely to be in the order of 20-30. The current Regulations can only, therefore, contribute to the establishment of a network of nationally-important areas, not deliver its entirety. A marine expert group of the EU Habitats and Ornithology Committees is currently reviewing the Annexes to the Directive. While it is theoretically possible that all the coastal and seabed marine landscapes could be added to Annex I of the Habitats Directive, the Pilot considers this to be highly unlikely given that the previous approach to listing habitats on Annex I has been selective. Furthermore, the approach to the selection of representative habitat areas outlined in paragraph 347, is rather at variance with the highly prescriptive site selection criteria set out in the Habitats Directive. One possibility is that the UK could propose, for addition to Annex I, those marine landscapes which meet the criteria for nationally-important features. However, such additions to the Annex would be dependent on EU agreement. The relationship between the Birds and Habitats Directives and the implementation of the marine protected areas programme under OSPAR will be the subject of future discussion and negotiation.

Regulation of human use and activity on marine areas

371. The Pilot's data on human use of the Irish Sea show that virtually all areas are potentially subject to some form of use or development. The 1994 Regulations do not define when management schemes for European marine sites are required nor how relevant authorities should use the Regulation 33 advice provided by the nature conservation agencies. In practice, separate arrangements are made for each European marine site and different standards of protection could be applied at different sites. To date, the Pilot is unaware of any instance where there has not been a need for a management scheme for a European marine site and it is difficult to envisage any situation where such a scheme would not contribute to effective site conservation. The Pilot concludes that a management scheme should be obligatory on nationally-important and European marine sites, and the organisation responsible for co-ordinating the development of the management schemes should be defined. Management schemes should be required to include certain components, e.g. (i) assessment of the sensitivity of features of interest to human impacts, (ii) planning to avoid deterioration and (iii) measures to restore features that are not in a favourable condition. Management schemes need not be complicated; indeed clarity and simplicity are greatly to be preferred.

372. In seeking to regulate activities that might damage a European marine site, lack of clarity over what is included in the term 'plan or project' leaves the 1994 Regulations ambiguous as to whether the term has general applicability, or whether it is limited to certain consenting regimes as listed in Part IV. This problem could be carried forward also into future offshore regulations. The issue has conservation importance since a plan or project attracts a more precautionary measure of control than do most other activities. In the short term, the compass of the term 'plan or project' should be clarified, but a longer term solution requires a single system to be established in which all types of activity are subject to assessment to ensure the site features are not damaged.

373. The uncertainty over whether sea fisheries operations are plans or projects in relation to European marine sites, is critical, since fishing has an impact on many sites. For example, failure to regulate damaging towed gear could limit the achievement of conservation objectives, and result in legal proceedings against the UK. Some Sea Fisheries Committees in England and Wales regulate fisheries within their powers of jurisdiction (6n miles) by means of a fishing management plan within the overall management scheme. This approach effectively treats a fishing activity as a plan or project subject to Article 6(3) of the Directive requiring consent. Such an approach has enabled rapid action to be taken to address damaging fishing activities.
374. The conservation of a marine area network will depend to a great extent on how the impacts of fishing activities can be assessed and regulated. Within territorial waters between 6-12n miles, the means available to Member States to manage fisheries have been potentially increased by the new Common Fisheries Policy regulation (Council Reg. 2371/2002). Measures are subject to CFP conditions; for example, they must be non-discriminatory and agreed to by other Member States with historic access rights through the mechanism of a Regional Advisory Council, or through a defined process of negotiation. New UK legislation would be required to achieve the potential benefits provided for in Regulation 2371/2002.
375. Beyond 12n miles, the means available to Member States to manage fishing are limited since legislation in this zone is reserved to the European Union. Consequently, Member States are not currently in a position to manage fisheries on nationally-important areas in this zone. The protection given to the Darwin Mounds demonstrates that there are arrangements through the CFP that can be used, albeit on a temporary 'emergency' basis. The Pilot expects that the Commission will in due course establish general means for long term protection for nationally-important marine areas including European marine sites.
376. The Pilot concludes that existing legislation is only capable of delivering an ecologically-coherent network of nationally-important areas in part, namely intertidally and for the subset of features covered by the EC Birds and Habitats Directives. Current legislation is not adequate to implement the UK's commitments to WSSD or OSPAR, nor of delivering an ecologically-coherent network of nationally-important marine areas. There are also gaps in the arrangements for regulating potentially-damaging human activities. While the Pilot concludes that additional national legislation will be needed, it does not necessarily recommend extension of the existing mechanisms. Instead, the opportunity should be taken to consider the development of a tailor-made solution to meet the needs identified. This solution could encompass recreational, historic, scientific and educational needs as well as nature conservation needs, and could provide support to sustainable fisheries.

Recommendations

R30 The seaward limit of Sites of Special Scientific Interest and Areas of Special Scientific Interest should be defined in law.

R31 Additional legislation is needed to ensure that an ecologically-coherent network of nationally-important areas can be established and conserved. This legislation should require that such a network be established and should set out the procedures for doing so. These should be as simple and straightforward as practicable and seek to replace or complement, rather than overlap, existing legislation.

R32 The legislation referred to in R31 should include provision for the preparation of a single management scheme for each area to ensure the conservation objectives for the area are met. The legislation should identify the organisation responsible for co-ordinating the development of the scheme, and a duty should be placed on the relevant regulatory authorities to carry out their functions in accordance with the scheme. Where a site crosses jurisdictions, a management scheme should be developed jointly by the relevant countries.

R33 The legislation referred to in R31 should provide for the effective regulation of potentially damaging activities which could affect the area adversely.

R34 The European Commission should clarify the means of achieving the effective regulation of fishing in nationally-important areas, including European marine sites, beyond 6n miles, and address the need for the appropriate assessment of CFP decisions and compliance with management schemes.

Protecting vulnerable marine species

377. The conservation needs of nationally-important features, including species, have been summarised in Chapter 8. The Pilot has identified a number of aspects where existing species protection measures fall short of what is required to meet conservation needs. These are i) additional measures that need to be taken in relation to species which are particularly vulnerable to 'incidental' harm, ii) a lack of a strategic framework to aid the recovery of certain nationally-important species, habitats or communities, iii) weaknesses in the controls relating to the introduction of non-native species, and iv) gaps in the transposition of the Habitats Directive requirements into national legislation. These issues are discussed further below.

Species vulnerable to incidental harm

378. The Wildlife and Countryside Act, 1981 provides for the protection of wild birds and for certain other animals and plants threatened within Great Britain and territorial waters. This protection makes it an offence intentionally to kill, injure, take, sell or disturb certain areas used by the protected species, among other provisions. This protection extends out to 12n miles. Supporting this, protection is also afforded to the fauna and flora of the marine environment through a variety of regulations applying to various sectors such as construction, disposal, and oil and gas extraction which require construction and disposal operations out to 200n miles to be carefully controlled under licence.

379. In the Wildlife and Countryside Act, offences against species are limited to actions of 'intent', the meaning of which is unclear in the legislation. In practice, most killing, injuring, taking and disturbance of protected marine animals and plants are the side effects of other activities such as fishing, seismic activity or pollution. Given the requirement to demonstrate 'intent', the existing defence relating to actions which are otherwise lawful and which have the incidental result of killing, injuring etc, appears superfluous. The Countryside and Rights of Way Act (2000) sought to address the problem of needing to demonstrate intent in relation to the offence of disturbance of cetaceans and basking sharks by adding the term 'recklessly' to 'intentionally', but no such amendment was made to the, potentially, more serious offences of killing, injuring or taking of protected species. Similar weaknesses apply to the wording of the 1994 Regulations, though there the word 'deliberately' is used rather than 'intentionally'.

380. There are a group of nationally-important species, including small cetaceans, large fishes such as sharks and, potentially, other species, for which an amendment to the legislation is necessary to give sufficient protection from 'incidental' acts which are adversely impacting their populations. As an alternative to amending the general species protection measures contained in existing legislation, it may be preferable to make specific provision for selected species, or groups of species, for which incidental killing, injury or capture constitutes a major conservation problem. The effect of such an amendment would be to make the killing, injury, taking or disturbance of such species an offence (i.e. remove the need to show intent). A defence should be provided in relation to acts which are incidental to otherwise lawful operations, but this defence would not be available if existing technical measures to reduce such incidental impacts are not taken.

Recovery of certain nationally-important species and biological communities

381. Threatened or declining nationally-important species or habitat communities may require recovery programmes to be instituted. Species or Habitat Action Plans (see paragraph 186) provide recovery programmes for some marine features but a more strategic legislative framework is needed for marine features. Extension of current species protection legislation to cover all UK waters may partly provide this framework but some additional measures will be necessary. For example, legal provisions similar to those in Section 74 of the Countryside and Rights of Way Act 2000, which require the Secretary of State and the National Assembly for Wales to publish lists of species and habitats requiring action to ensure their survival and recovery, and to promote such action, should be extended to the whole marine environment under national jurisdiction. A duty should be placed on public bodies to work towards the agreed targets and status of the features concerned, and emergency powers provided to regulate activities likely to damage such features.

Control of non-native species

382. The Wildlife and Countryside Act, 1981 also regulates the introduction and release of non-native animals and certain plant species. This is supported by other legislation relating to fisheries and shell-fisheries. However, the problem of containment and prevention of escapes (as in fish farms) is not adequately covered in the Wildlife and Countryside Act, 1981 where no offence is committed until the animal has actually escaped. Measures are required to provide for the adequate containment of non-native species and to require the taking of appropriate control or eradication measures when a potentially-invasive non-native species has escaped or been released unlawfully. In 2001, Government commissioned a Review of Non-native Species Policy which reported in 2003. Government has responded to the report with initial views on how it proposes to tackle the issues raised (www.defra.gov.uk/corporate/consult/nnspecies-policy/index.htm).

Transposition of requirements of the Habitats Directive

383. The draft Offshore Regulations will, when they come in to force, address the main gap in transposing the Habitats and Birds Directives into national law, which is to apply their provisions to the 12-200n mile zone. However, there are two issues that the Pilot considers necessary to draw attention to in particular:
- i. Article 11 of the Habitats Directive states that Member States shall undertake surveillance of the conservation status of habitats and species of Community importance. This is of particular relevance for the marine environment as a lack of knowledge continues to hinder conservation efforts greatly. The 1994 Regulations do not make provision for such surveillance. Defra are currently consulting on proposals to amend the 1994 Regulations, and to include a provision in the proposed Offshore Regulations, with respect to this;
 - ii. the provision of Article 14(1) of the Habitats Directive which relates to the protection of some commercial species from over-exploitation (Annex V species, which include some important migratory fishes), have not yet been transposed into national legislation and is not included in the current proposals to amend the 1994 Regulations nor in the draft Offshore Regulations. The Pilot considers that this needs to be rectified.

Recommendations

R35 National legislation should make it an offence to kill, injure or take any species listed for such protection without the need to show intent. A defence should be provided in relation to acts incidental to otherwise lawful operations but this defence should be removed if available technical measures to reduce such incidental impacts are not taken.

R36 The requirement for the Secretary of State and other relevant Ministers to list species and habitats requiring recovery measures to be taken for their conservation, and to promote such measures, should be applied to all national waters.

R37 Controls over the introduction of marine non-native species should include measures to provide for adequate containment, enforcement and the eradication of problem non-native species.

R38 The provisions in the Habitats Directive relating to surveillance of habitats and species of Community importance, and in relation to regulating the exploitation of Annex V species, should be transposed into national legislation.

Protection for marine landscapes

384. The main value of the marine landscape classification is that it provides a visual picture of marine ecosystems that will be useful in developing marine strategic planning and setting conservation policies for habitats and species characteristic of the various marine landscapes. The principal means of achieving the necessary level of protection will be i) through spatial planning (see **R29**), ii) protected marine areas and iii) the range of cross-sectoral measures considered below.

The Regulation of development and sectoral activities which have an impact on marine nature conservation

Strategic Environmental Assessment

385. The EU Directive on Strategic Environmental Assessment (2001/42/EC) will apply to plans and programmes within its scope (fisheries, energy, industry, transport, tourism, waste disposal, including disposal of dredgings, and water management), which set the framework for future development consent of projects listed in Annexes I and II of the Environmental Impact Assessment Directive prepared after 21 July 2004. The UK Government (Office of the Deputy Prime Minister) and devolved administrations are preparing regulations to implement the Directive. Relevant projects include: intensive fish farming, extraction of petroleum and gas, windfarms, power stations, pipelines, extraction of minerals, construction of harbours and ports, coastal work, marinas and holiday villages. Strategic Environmental Assessment is also required on plans and programmes that require an assessment under the Habitats Directive and to those that set the framework for future development consent of projects and are likely to have significant environmental effects.

386. Ahead of the Directive, the Department of Trade and Industry has been undertaking, since 1999, a rolling programme of Strategic Environmental Assessment on the UK Continental Shelf prior to the release of blocks for oil and gas licensing. These Assessments have already resulted in better protection for the marine environment through a more integrated approach to decision-making and are used as demonstrations of good practice. They have also generated a large resource of valuable data about the marine environment.

387. The Office of the Deputy Prime Minister has published guidance on the application of the Directive to land-use plans and is currently preparing generic guidelines for all plans and programmes subject to the Directive. The European Commission has produced a more general guide to the Directive, focussing on its basic concepts and requirements.

388. The Directive applies to proposals or activities that can be defined as plans or programmes and for which there is a consenting or licensing regulatory framework at the project level. This may result in existing fisheries, (the human activity having the greatest impact at sea) falling outside the scope of Strategic Environmental Assessment. Fisheries could, and should, be assessed as plans or programmes in various ways. For example, fishing could be assessed spatially at the ICES area

or regional sea scale, and/or temporarily on an annual basis by species fished or by gear types for mixed fisheries. If fisheries were classified in plans and programmes, then subject to the other tests (i.e. setting the framework for development consent, and consents required by legislative, regulatory or administrative provision) in the Directive, Strategic Environmental Assessment could then be applied to all fisheries activities.

389. In the Regional Sea context, the transboundary requirements on consultation in the Strategic Environmental Assessment Directive are important. Where the implementation of a plan or programme prepared in one Member State is likely to have a significant effect on the environment of other Member States, provision has to be made for the Member States to enter into consultations and for the relevant authorities and the public to be informed and enabled to express their opinion.
390. The Directive requires monitoring of plans or programmes assessed to ensure that impacts do not exceed predicted levels and that unforeseen impacts do not occur. There should be the facility to amend the assessments and review decisions if impacts are not as expected. A requirement to monitor is particularly important in the marine environment where impacts may occur unnoticed. Marine monitoring is expensive, and adequate provision should be included in development costs. It is not clear if monitoring will become a duty in the regulations arising from statutory Strategic Environmental Assessment or if decisions will be left to regulatory bodies responsible for administering Strategic Environmental Assessment.

Recommendations

- R39 The application of the Strategic Environmental Assessment Directive to fisheries and marine transboundary issues should be clarified. The publication of detailed guidance designed for marine plans or programmes is required.**
- R40 Agreement with the fishing industry should be sought on how fisheries activities should be defined in plan or programme terms and on the adoption of a policy to undertake Strategic Environmental Assessment of fisheries.**
- R41 Monitoring of the implementation of plans or programmes should be made a duty in the Strategic Environmental Assessment regulations to assess the accuracy of environmental changes predicted by the Strategic Environmental Assessment process and to ensure that unexpected impacts have not occurred.**

Water quality

391. The EU Water Framework Directive provides an integrated legislative framework for the delivery of conservation objectives for water bodies. A key purpose of the Directive is to achieve/maintain surface waters in good ecological status, including transitional and coastal waters out to 1n mile from baseline. The Directive's provisions will be implemented to 3n miles in Scotland; other Member States are pressing the Commission for this boundary Europe-wide, and Defra are undertaking a regulatory impact assessment for England and Wales. In general, offshore water quality can be expected to be high and developments of a scale that would impact water quality are not anticipated at present. However, a statutory framework for the protection of marine water quality would ensure any future impacts could be regulated. One approach could be to apply the principles of the Directive across the whole marine area under national jurisdiction.
392. Such an extension of the Directive, could require an extension of the environmental agencies' remits beyond 3n miles, but a large amount of additional monitoring would not be required unless extensive developments took place posing a threat to offshore water quality.

Recommendation

R42 A statutory approach to surface water quality should be applied to the whole marine environment. A framework could be based on extension of aspects of the approach required by the Water Framework Directive such as measures of ecological quality, the status and quality of water bodies, and the use of objectives.

Sea fisheries

393. The success of the new CFP regulation (2371/2002) will depend upon its implementation. The Pilot is not confident that continued reliance on technical measures, quotas and means of reducing fishing effort will be sufficient to protect and recover fish stocks. These measures may damage the industry without achieving benefits for stocks. To date, the CFP has not sufficiently considered the potential benefits of other approaches to fisheries management such as the use of long-term protected areas. Although there are a number of marine protected areas already in place under fisheries legislation, such as the Wee Bankie sandeel closure, the mackerel, Shetland and plaice boxes, and the Irish Sea closure, these are not adequate to test fully the marine protected areas approach. This is a complex issue, as the different fish species and stocks will certainly respond to protected area measures in different, and not necessarily foreseeable, ways. In the Pilot's view the use of long term protected areas at the Regional Sea level should be tested in carefully designed, time-limited, area-based trials set up with the support and participation of the fishing industry. A network designed to protect the spawning, nursery and important feeding areas of commercial species could help to create a long-term sustainable yield from some of the most reduced stocks.
394. Compensation to the fishing industry and adequate enforcement may be required to ensure trials are carried through to completion. However, there is a strong possibility that protected areas can be managed more efficiently and cheaply, with less complex regulation, than many existing fisheries management mechanisms. Trials should accompany the setting up of an ecologically-coherent network of representative nature conservation areas to ensure the maximum multiple benefits of each site.
395. The new CFP regulation enables increased stakeholder involvement through the establishment of Regional Advisory Councils. However, the areas currently proposed for Regional Advisory Councils are much larger than the Regional Sea scale and this could preclude effective stakeholder participation at the regional level. For example, the Pilot considers that the Irish Sea appears to be the right scale to establish a Regional Advisory Council because it has relatively discrete fisheries within the area and it requires tailored policies at the Regional Sea scale. At present, there does not appear to be adequate resource provision for running the Councils, nor sufficient commitment that the Commission will implement their recommendations. The Pilot considers that Regional Advisory Councils should have a balanced fisheries management and environmental protection remit; it is important that they are not dominated by the fishing industry. Environmental interests should be strongly represented with environmental concerns being reflected in the advice provided.
396. Most of the Irish Sea fisheries are managed on the basis of 7 pressure stocks, but other non-quota species are caught and landed (e.g. skates, rays, seabass and most shellfish) The CFP uses conservation measures such as mesh sizes, catch composition targets and minimum landing sizes to manage non-quota commercial species (Council regulation 850/98). In the UK, there are measures to protect seabass and shellfish such as licensing schemes for crabs, lobster, crawfish and scallops. The Pilot is concerned that the CFP and national conservation measures are not adequate for the species that can be the subject of diversification when other fisheries are restricted. The use of fisheries management protected areas would bring benefits for stocks of these species.

397. The new CFP regulation does not address sufficiently the need for a reduction in by-catch of quota and non-quota commercial species, and also non-target species including cetaceans. The UK intends, in 2004, to introduce measures outlined in the UK small cetacean bycatch response strategy, including legislation to require the use of technology (pingers) on gill nets to reduce bycatch. There are also European Commission proposals currently under discussion for a similar measure through a CFP regulation.
398. The discarding of unwanted fish at sea damages fish populations, and the addition of excess food material to surface waters has an unbalancing impact on bird and mammal populations. A Community action plan on discards was proposed in a Commission communication in 2003, including modifications to the range of technical conservation and other measures. The potential benefits of a ban on discards will be examined for possible implementation in 2006.
399. Inshore fisheries in Scotland are managed centrally by the Scottish Executive who are currently reviewing how the industry is regulated. An increase in local involvement in inshore fisheries management, such as by the establishment of industry-based local fisheries committees, is likely to be recommended.
400. The arrangements for inshore fisheries management in England and Wales are being examined in the Defra review of Marine Fisheries and Environment Enforcement Arrangements. Increased national level management of fisheries within the 6-12n mile zone is now permitted under the Common Fisheries Policy although this would require new legislation. The benefit of such increased national management would be that it would facilitate the management of fisheries at the local and regional level. It would increase the opportunity for developing innovative schemes of fishery management, including measures to test the benefits of no-take zones, and would enable fisheries management to be more responsive to local and regional needs. The Pilot would encourage the Defra review to consider this issue and how best it could be implemented having regard to the existing role of the Sea Fisheries Committees in the 0-6n mile zone and of Defra in the 6-12n mile zone.
401. Pending the outcome of these reviews, the Pilot considers that, at the least, there should be good co-ordination in relation to fisheries management throughout UK territorial waters, with a view, particularly, to developing shared objectives for such management between countries at the Regional Sea scale.

Recommendations

- R43 Closer integration of fishing industry and nature conservation objectives should be developed, including by using an ecologically-coherent network of protected areas to support fisheries management.**
- R44 Small scale, funded, trials of protected areas including no-take zones should be set up at the Regional Sea scale with the involvement of the fishing industry. The results of trials established on fish numbers and population health should be monitored to assess the costs and potential benefits of protected areas and no-take zone management mechanisms.**
- R45 Regional Advisory Councils should be established, at the appropriate scale to enable effective stakeholder involvement. The Councils should have a combined fisheries management and environmental remit and should be empowered to test Regional Sea scale fisheries management options developed through cross-sectoral partnership working. A Regional Advisory Council should be established for the Irish Sea.**

- R46 Adequate conservation measures for non-quota commercial species should be prepared at national and European levels, including the identification of protected areas and the setting of safe biological limits to maintain an ecologically-sustainable fishery for each stock.**
- R47 Proposals for national legislation and a CFP regulation requiring the use of pingers to protect cetaceans from bycatch should be enacted, monitored and enforced. Further measures to limit by-catch of undersize target species and non-target species should be developed and resources for enforcement should be increased to ensure the regulations are effective.**
- R48 The Community action plan to reduce discarding should be implemented in full, including within the Irish Sea, to promote the restoration of damaged stocks.**
- R49 The national management of fisheries within the 6-12n mile zone should be strengthened under new legislation, as is now permitted by the Common Fisheries Policy, to provide enhanced national control of such fisheries to address local and regional needs. Additional powers and resources to implement new management approaches and improve the enforcement of regulations should be provided. International co-ordination to develop shared objectives for such management should be carried out at the Regional Sea scale.**

Aquaculture

402. The recently published 'Strategic Framework for Scottish Aquaculture' and the new 'Location Guidelines' have gone some way towards more holistic regulation of aquaculture in Scotland, although the framework may need further integration with water quality and fisheries. The extension of the planning powers of Local Authorities in inshore waters for aquaculture in the Water Environment & Water Services Act 2002 is a significant move towards spatial planning in coastal waters. The Welsh Assembly Government also has a strategic plan for aquaculture. There is no strategic approach to mariculture in England but there is a Community initiative to prepare a strategy for the sustainable development of European aquaculture.
403. The Pilot considers that mariculture developments should be subject to Strategic Environmental Assessment and Environmental Impact Assessment as part of the wider spatial planning of inshore waters. Assessment should be based on nutrient modelling and water body carrying-capacity estimates, to determine the positive and negative impacts that shellfish may have. The consenting and licensing assessment should cover and include environmental conditions.

Recommendation

- R50 Integrated planning and management strategies for mariculture should be prepared throughout the UK which take account of all global impacts such as on fisheries, nature conservation and water quality.**

Shipping and navigation

404. The shipping industry is regulated to a large extent by the International Maritime Organisation (IMO) which implements global conventions such as MARPOL. This international dimension to shipping means that the greatest progress is made when the UK acts in consort with other nations to develop and implement environmental measures. The ongoing implementation of MARPOL annexes and other new initiatives, such as the International Convention for the Control and Management of Ships' Ballast Water and Sediments (set for adoption with regulations to prevent the transfer of harmful aquatic organisms in ballast water in February 2004), the 2000 Port Waste Facilities Directive implemented by UK regulations in 2003, and the International Convention on

the Control of Harmful Anti-fouling Systems on Ships (adopted in 2001 and implemented in 2003) are improving the overall regulatory framework. In addition, UK Government departments and the shipping industry are working together to draft a UK environmental strategy for shipping. The strategy is intended to assist the industry in being more proactive in addressing environmental issues such as ballast water, vessel regulation (including fishing vessels), anti-fouling, sewage and other discharges, and the need to strengthen enforcement.

405. In 1994, the report 'Safer Ships Cleaner Seas' (the Donaldson Report) recommended that Marine Environment High Risk Areas (MEHRAs) of high environmental sensitivity and at risk from shipping should be identified around the UK coastline. A set of possible MEHRAs, with associated measures, was identified in May 2002. However, UNCLOS limits restrictions to freedom of navigation and there are also concerns as to how mariners would be alerted to MEHRAs, the measures that would be implemented and how these measures would be reviewed for effectiveness. Overall, progress in implementing MEHRAs has been slow.
406. An IMO proposal to establish a major Particularly Sensitive Sea Area (PSSA) under MARPOL for western Europe stretching from southern Portugal to north of Shetland was agreed by the Marine Environment Protection Committee and has now moved on to further consideration within IMO. If this PSSA is adopted, it will put MEHRAs (within the PSSA) in a suitable wider environment context and it will be easier to introduce appropriate protective measures in relation to shipping. The Pilot supports all these initiatives to improve the environmental regulation of shipping.
407. Control over the introduction of non-native species to the UK seas via ship's ballast water should be addressed by the IMO Ballast water regulations. However, there is currently no control to minimise the transfer of non-native species by other ships vectors (e.g. hull fouling). These vectors may contribute significantly towards the transport of non-native species, particularly with the phasing out of TBT as a highly effective anti-fouling agent.

Recommendations

R51 Measures to implement Marine Environment High Risk Areas should be brought to a rapid conclusion, and incorporated within the wider MARPOL Particularly Sensitive Sea Area for Western Europe.

R52 The accidental introduction of non-native species by ships, such as via hull fouling, should be researched and options for control developed.

Renewable energy developments

408. The Department of Trade and Industry proposals to make oil and gas developments subject to the same regulations as other activities, and to improve the Electricity Act so that it applies to the whole marine environment and is used routinely, will help to build consistency. The Review of Development in Coastal and Marine Waters is expected to report in early 2004 and should provide solutions to many consent issues.
409. The current consenting procedure for renewable energy generation in the marine environment is complex, with alternative consenting routes via the Electricity Act or the Transport and Works Act as well as multiple planning and regulatory authorities. New licensing regulations for developments outside of territorial waters could add to this complexity rather than providing an integrated solution. Concerns have been expressed that landscape issues may be overlooked in the decision-making process for renewable energy developments because they cannot be included in licence conditions under the Food and Environment Protection Act or the Electricity Act. Developments taking place adjacent to the coast are covered by the planning system but this is not the case further offshore, and this issue needs to be addressed.

Sand and gravel extraction, dredging and spoil disposal

410. In the UK, the dredging of marine sand and gravel from the seabed below mean high water is regulated under a number of different regimes depending on location and purpose. The Office of the Deputy Prime Minister administers the commercial dredging of marine aggregates by the non-statutory Government view procedure. This will be replaced by the Environmental Impact Assessment and Habitats (extraction of minerals by marine dredging) Regulations which will apply in England, Wales and Northern Ireland from 2004. Where the proposed dredging area falls within the jurisdiction of a local planning authority, the activity is regulated by the Department for Transport.
411. Dredging by a harbour authority, whether for maintenance or capital (new excavation) purposes, will normally be authorised under the relevant harbour legislation. A dumping licence will, however, need to be obtained for the disposal (or placement) of the dredged material in the maritime area.
412. The lack of integration between legislation regulating dredging and the disposal of dredge spoil, is an accepted weakness in the current regime. The formation of the Marine Environment and Consents Unit in Defra (including Coastal Protection Act regulation from 2004) has started to address this issue, and the Pilot expects that the Review of Development in Coastal and Marine Waters will bring further rationalisation.

Tourism and Recreation

413. The use of fast motorised craft is increasing and there are calls for activities using these craft to be better regulated. Conservation impacts are generally small, but they may cause disturbance to cetaceans and birds or damage to fragile habitats in estuaries such as salt marsh or sea grass beds. A practical constraint on the effective use of bylaws regulating the use of small boats and personal watercraft is the lack of capacity for enforcement.
414. A national boat registration scheme to support enforcement of legislation and regulations has been proposed. However, this would be expensive to set up, operate and enforce, and is probably more than is required to solve the problem. Many prefer the use of local schemes run by estuary or coastal groups using bylaws, environmental codes for users and based on voluntary enforcement. However, if these do not prove adequate, a national scheme may still be the only option.

Recommendations

R53 Voluntary partnership, or local bylaw, approaches to regulation of small motorised craft should be developed with users. A national, consolidated code of conduct should be established to prevent disturbance of marine wildlife from noise generated by motorised craft.

14. ENFORCEMENT

415. The Pilot reviewed existing enforcement responsibilities and experience in the marine environment through work commissioned from the Institute of Estuarine and Coastal Studies, University of Hull, (Boyes *et al.*, 2003b, Boyes and Elliott, 2003). The Pilot was also assisted by a review undertaken by the marine subgroup of the Partnership for Action against Wildlife Crime (contributed directly but reported in Boyes and Elliott, 2003).

Current enforcement responsibilities

416. A summary of current enforcement responsibilities in the UK marine nature conservation-related sector (adapted from Boyes *et al.*, 2003b) is given in Table 12.

Table 12 Current enforcement responsibilities in the UK marine nature conservation-related sector

Enforcement agency	Principal enforcement responsibilities
Statutory nature conservation agencies	The agencies are the prosecuting agency for offences in relation to Sites of Special Scientific Interest in England and Wales. The agencies enforce bylaws made on their nature reserves.
Police	The police are the principal terrestrial enforcement agency in relation to species protection legislation. They also have a role in enforcement of nature conservation and other bylaws and in relation to illegal releases of non-native organisms. They are involved in enforcement in the marine environment to a limited extent and there are some half a dozen marine police units in the country.
Sea Fisheries Inspectorate (English and Welsh zone), Scottish Fisheries Protection Agency (Scottish Zone), Northern Ireland Sea Fisheries Inspectorate (NI waters)	The Inspectorates are responsible for the enforcement of European Union and national sea fisheries legislation under the Common Fisheries Policy within British sea fisheries limits (out to 200n miles or the medium line between neighbouring countries). The Inspectorates co-ordinate surveillance using patrol vessels, aerial and satellite surveillance techniques. British Sea Fisheries Officers are located in port offices, and carry out patrols at sea. The Sea Fisheries Inspectorate (Defra) has contracted the Royal Navy to carry out enforcement at sea. The Scottish Fisheries Protection Agency owns its own protection vessels and two surveillance aircraft which are managed by Direct Flight. The Northern Ireland Sea Fisheries Inspectorate operates a fishery protection vessel, working mostly inshore, together with an RIB. Sea Fisheries Inspectors and/or Defra Investigation Branch are also designated enforcement officers under the Food and Environment Protection Act, 1985.
Ministry of Defence Police	MoD police can be sworn in as Fisheries Officers and have a range of environmental responsibilities including enforcement of fishing, and setting restrictions, enforcement of local bylaws and pollution control. They possess a substantial sea-going capability having the largest number of launches and RIBs of any police force in the UK.

Enforcement agency	Principal enforcement responsibilities
Royal Navy	The Royal Navy, working under contract to Defra in the English and Welsh zone, operates a Fisheries Protection Squadron with personnel sworn in as Fisheries Officers. It also provides assistance to HM Customs and Excise, and to other enforcement agencies, and has an enforcement role in pollution controls relating to oil and gas installations.
Sea Fisheries Committees	Sea Fisheries Committees enforce fisheries legislation, including their own fisheries and environment bylaws, out to 6n miles in England and Wales. Most Sea Fisheries Districts have two boats, a large vessel over 10m and a RIB for shallow water inshore work.
Maritime and Coastguard Agency	The Maritime and Coastguard Agency carries out inspections of UK ships, including small passenger ships, fishing vessels, and foreign registered cargo and passenger ships using UK ports, for the purpose of enforcing national and international shipping safety and navigation standards, pollution prevention from shipping, and crew competence and welfare. The agency also investigates incidents involving ships.
Harbour Authorities	The Harbour Authorities are responsible for ensuring navigation and pollution prevention in harbour areas. Associated British Ports, which is the harbour authority for 21 ports around the UK, can prosecute through the Magistrates Courts.
Local authorities	Local authorities are responsible for enforcement of development controls, usually down to low water mark, and also have a role in enforcing their bylaws in relation to recreational activities in near-coast waters.
Environment Agency (England and Wales), Scottish Environment Protection Agency (Scotland), Environment and Heritage Service (Northern Ireland)	The environment agencies are the authorities responsible for protecting fresh and tidal waters from discharges via pipes (including cage fish farms). Where a criminal offence has been committed, the agencies will consider instituting proceedings. The agencies have the power to prosecute in relation to pollution incidents from shipping in controlled waters. The Environment Agency and SEPA have power to prosecute for criminal offences relating to damage to coastal defences. Where no Sea Fisheries Committee has been established, the Environment Agency is the sea fisheries authority in a number of estuaries.
HM Customs and Excise	HM Customs and Excise enforce the provisions relating to illegal imports including those covered by the Convention on International Trade in Endangered Species. HM Customs and Excise has a fleet of coastal patrol vessels backed up by smaller boats working closer inshore. The vessels are equipped with tracking devices and radio-controlled underwater cameras are also used.
Centre for Environment, Fisheries and Aquaculture Science (CEFAS)	CEFAS conducts research, monitoring and assessment of fish stocks, and carries out routine site inspections, monitoring of imports, including of non-native fish and shellfish species. CEFAS also has a monitoring role in relation to dumping at sea and various marine engineering and development activities under the Food and Environment Protection Act 1985. Certain CEFAS staff are also designated enforcement officers under the Food and Environment Protection Act.

Enforcement agency	Principal enforcement responsibilities
Crown Estate Commissioners	Vessels dredging for marine aggregates under licence from the Crown Estate have to be fitted with an electronic monitoring system which automatically records the date, time and position of all dredging operations. Diskettes are analysed by the Crown Estate at monthly intervals to check operations against licence conditions. Development in the intertidal zone also requires a licence from the Crown Estate.

Enforcement of marine nature conservation legislation

417. The HM Customs and Excise, the police and the nature conservation agencies have a specific remit that includes nature conservation enforcement. Conditions attached to Food and Environment Protection Act licences enforced by Defra ensure nature conservation interests are protected. This is the mechanism that appears to be most effective, having brought significant numbers of prosecutions, though these relate to the licence conditions, not wildlife legislation. There appears to be no co-ordinated recording of such prosecutions or incidents which complicates an assessment of the enforcement shortfall and the nature conservation benefits of enforcement. The different remits of the agencies mean that enforcement is generally unco-ordinated at a strategic level and limited at the local level. A new framework for co-ordinated action would be expected to bring benefits.
418. Enforcement of nature conservation legislation is achieved, in relation to intertidal areas, and seas immediately adjacent to the coasts, by close co-operation between the nature conservation agencies, non-governmental conservation organisations, the police and local authorities. With increasing distance from the immediate coastline, enforcement by these organisations is rendered increasingly difficult. Experience in relation to enforcing marine nature reserve bylaws has demonstrated the difficulty of effective enforcement in marine situations without the necessary equipment and resources, and where it is more difficult for the police to provide rapid assistance.
419. Away from immediate coastal areas, the responsibility for enforcing the species protection legislation lies primarily with the police, who do not have the vessels and resources to carry it out. The Conservation (Natural Habitats &c) Regulations 1994, do not specify enforcement responsibility in relation to marine Special Areas of Conservation or Special Protection Areas beyond the general provisions in Article 3 requiring competent authorities to exercise their functions so as to secure compliance with the Directive, and also Article 101 which gives the police the necessary powers of entry, stop and search. The Pilot has not been able to determine the extent to which there may be a shortfall in enforcement powers in relation to Natura 2000 sites. In practice, nature conservation bylaws passed to protect European marine sites cannot be enforced effectively because neither the nature conservation agencies nor the police have the necessary vessels and other resources. The ability of other agencies to carry out enforcement action will be limited by the legislation under which they operate. What is quite clear, however, is that, away from the immediate coast, very little enforcement of nature conservation legislation is taking place.
420. A key enforcement issue for marine nature conservation is the enforcement of fisheries legislation as it relates to sustainable fisheries and the conservation of protected species and of important areas. Fishing is the activity which has the single most adverse impact on marine nature conservation, and the effective enforcement of the legislation with respect to fishing is crucial. Within 6n miles Sea Fisheries officers can only act on nature conservation offences if they receive a specific complaint. Beyond 6n miles, neither the Navy nor the Defra Sea Fisheries Inspectorate currently has a remit to take action in support of nature conservation. An extension to their remit for marine nature conservation would be a significant step forward.

421. To be effective, enforcement needs to meet the following criteria:
- i. the responsibility for the enforcement of marine nature conservation legislation needs to be made explicit;
 - ii. the authority(ies) responsible for the enforcement of marine nature conservation legislation need(s) to have the requisite powers of stop, search, seizure and arrest, and the necessary vessels and resources to carry out that enforcement, or needs to have ready and sufficient access to others having those powers and resources;
 - iii. where a number of different organisations have responsibility for various aspects of the enforcement of nature conservation-related legislation, measures should be taken to ensure the necessary level of collaboration and co-ordination.
422. There is usually benefit in co-ordinating enforcement responsibility very closely with surveillance responsibility, making the most efficient use of vessels, equipment, expertise and information. At the least, those carrying out surveillance should be able to request a rapid enforcement response.
423. Enforcement responsibility is likely to be different for the intertidal and near coast areas, than for areas further away from the coast. The Pilot has not been able to carry out a full investigation of enforcement issues, but, given the availability of vessels, equipment and other resources, and the relationship between marine nature conservation and fishing, the Pilot considers that responsibility for the enforcement of nature conservation away from the coast may be placed most effectively with those having responsibility for the enforcement of fisheries legislation.
424. The Pilot acknowledges that the current review being undertaken by Defra into Marine Fisheries and Environmental Enforcement Arrangements in England and Wales will be able to look into some of the enforcement issues summarised above in more detail and looks forward to the conclusions and recommendations of that review.
425. The following recommendations are made in relation to enforcement issues:

Recommendations

- R54 The responsibility for the enforcement of marine nature conservation legislation should be made explicit. That responsibility may be different in intertidal and nearshore situations from that further offshore.**
- R55 The authority(ies) responsible for enforcing marine nature conservation should have, or should have ready access to, the requisite powers of stop, search, seizure and arrest, and the necessary vessels, equipment and other resources necessary to carry out that enforcement effectively.**
- R56 Where a number of different organisations are involved in carrying out marine nature conservation enforcement, new, probably statutory, collaboration, co-ordination and training measures should be developed and put in place.**
- R57 A co-ordinated national system for recording offences, incidents and prosecutions in relation to marine nature conservation should be put in place.**

R58 A detailed investigation should be undertaken to consider the level of enforcement action necessary to implement existing and proposed new marine nature conservation legislation, what vessels, equipment and other resources are required to carry out that enforcement, and which organisation(s) should have the enforcement responsibility away from near coast situations. While the Pilot defers a recommendation on enforcement responsibilities pending the current Defra review on marine fisheries enforcement arrangements, it suggests that nature conservation enforcement away from near shore locations may best be undertaken by those undertaking the enforcement of fisheries legislation.

15. GOVERNANCE

Current regulatory responsibilities

426. The Pilot reviewed existing regulatory responsibilities and experience in the marine environment through work commissioned from the Institute of Estuarine and Coastal Studies, University of Hull, (Boyes *et al.*, 2003b). A summary of current regulatory responsibilities is shown in Table 13. These parallel, but in important respects are different from, the responsibilities for enforcement reported in Chapter 14 and demonstrate the complexity and variation of the regulatory and consenting procedures to which users and developers are subject in the United Kingdom.

Table 13. Current regulatory responsibilities in the UK marine nature conservation - related sector

Authority	Regulatory responsibility
Environment Ministers and Departments: Defra, Scottish Executive Environment and Rural Affairs Department (SEERAD), National Assembly for Wales (NAW), Department of the Environment Northern Ireland (DoENI)	<p>Departments are responsible for designating European Marine Sites, establishing Marine Nature Reserves, and listing species on protected schedules. Also for issuing licences relating to protected species; and to the release of non-native species.</p> <p>Departments regulate the disposal of wastes at sea and the placement of structures under the Food and Environmental Protection Act (Marine Consents and Environment Unit in England and Wales).</p> <p>SEERAD regulate maintenance dredging in estuaries and coastal waters in Scotland. In Northern Ireland, the Environmental and Heritage Service regulates the disposal of wastes at sea and the placement of structures under the Food and Environmental Protection Act.</p> <p>Departments have policy responsibility relating to inputs of contaminants to the marine environment originating from land, but actual regulation is carried out by the respective environment agencies.</p> <p>Defra have policy responsibility for flood defence and coast protection in England and Wales.</p>
Agriculture and fisheries Ministers and Departments: Defra, Scottish Executive Environment and Rural Affairs Department (SEERAD), National Assembly for Wales (NAW) Agricultural Dept, Dept of Agriculture and Rural Development (Northern Ireland)	<p>Departments are responsible for issuing licences relating to protected species for agriculture and fisheries purposes, and for the regulation of the plant and animal health Acts, including in relation to fish and shellfish.</p> <p>Responsible for UK fisheries within 0-12n miles (in England and Wales this function is exercised by the Sea Fisheries Committees between 0-6n miles), and for the registration and licensing of fish farms under the Food and Environmental Protection Act. In Scotland, Fisheries Research Services maintains the fish farm register.</p>

Table 13 (continued)

Authority	Regulatory responsibility
Statutory nature conservation agencies: English Nature, Scottish Natural Heritage, Countryside Council for Wales, Environment and Heritage Service	Responsible for the notification and furthering the conservation of SSSIs & ASSIs, and declaration of National Nature Reserves. Also responsible for making byelaws for National Nature Reserves, Marine Nature Reserves and European Marine Sites. They also issue licences relating to protected species for scientific and conservation purposes and for photography.
Statutory heritage agencies	Responsible for conservation of historic buildings, scheduled ancient monuments and historic wrecks.
Environment agencies (including the Environment Agency, the Scottish Environment Protection Agency and the Environment and Heritage Service)	<p>In England and Wales, the Environment Agency regulates fisheries for migratory species, e.g. salmon, trout and eel. Where no Sea Fisheries Committee has been established, the Environment Agency is the fisheries authority in a number of estuaries.</p> <p>All responsible for regulating and authorising discharges via pipes, including discharges from fish farms to estuaries and coastal waters and for related monitoring including the classification and monitoring of bathing waters, and have operational responsibility relating to flood defence.</p>
Sea Fisheries Committees (SFC)	Regulate commercial sea fisheries and shell fisheries in England and Wales from 0-6n miles. They are able to make byelaws to regulate fisheries including where this is necessary to safeguard the marine environment, and also carry out relevant monitoring activities.
Marine Consents & Environment Unit (MCEU)	<p>MCEU is an alliance of the Marine Environment Branch of Defra, and Ports Division (Casework Branch) of the Department for Transport. MCEU provides a central facility for administration on behalf of both Departments of applications to undertake works in tidal waters and at sea, including marine developments, offshore energy, coast defences, navigational dredging, extraction of seabed deposits, and waste disposal.</p> <p>MCEU issues consents and licences under the Food and Environment Protection Act and the Coastal Protection Act for works on, over, or under the seabed which may cause or result in an obstruction or a danger to navigation and under the Telecommunication Act for cables. MCEU issues consents to harbour authorities for works in their areas dependent on the terms of the local legislation pertaining to that harbour.</p> <p>The Unit also administers certain applications on behalf of the National Assembly for Wales which is the licensing authority in Welsh waters.</p>

Table 13 (continued)

Authority	Regulatory responsibility
<p>Transport Ministers and Departments: the Dept for Transport, Scottish Executive Transport and Lifelong Learning Department (SETLLD), and Dept of Agriculture and Rural Affairs (Northern Ireland)</p>	<p>In Scotland, SETLLD regulates navigational dredging under the Coastal Protection Act and has overall policy responsibility for flood defence and coast protection, but maintenance dredging in estuaries and coastal waters is the responsibility of SEERAD. In Northern Ireland, Environment and Heritage Service regulates the disposal of dredged material.</p> <p>The Secretary of State for Transport is responsible for approvals of harbour works by way of Harbour Revision or Empowerment Orders and for the approval of any byelaws promoted by harbour authorities.</p> <p>The control of dredging is included in the definitions contained above. Departments are responsible for international shipping, maritime safety and ballast water policy and conventions through the Maritime and Coastguard Agency.</p> <p>Departments are also responsible for the authorisation of electricity cables and pipelines, and telecommunications cables.</p>
<p>Ports and harbours authorities</p>	<p>The authorities are able to direct vessels to ensure safety of navigation, pollution prevention and clean up in relation to ports and harbours. They are also required to provide waste reception facilities for ships entering ports and harbours. Harbour authorities have wide byelaw-making powers to regulate the movement of vessels within a port. Such byelaws can regulate recreational craft and also bathing.</p>
<p>Ministry of Defence (MOD)</p>	<p>MOD is responsible for naval dockyards, naval vessels and military firing ranges in defence of the Realm, including in Crown Dependencies, and Overseas Territories.</p> <p>The Secretary of State for Defence has power to make byelaws applying to:</p> <ol style="list-style-type: none"> a. sea and tidal water that either abuts on defence land or over which firing takes place from defence land; b. any area of sea, tidal water or shore used for defence purposes, provided that it lies at least partly within the seaward limits of territorial waters. <p>Byelaws may be made for regulating the use of the area and securing the public from danger. They may therefore exclude other uses of the area. The consent of the Secretary of State for Transport is required if the byelaws interfere with public rights of navigation, anchoring, grounding, fishing, bathing, or recreation. The Secretary of State for Transport must first publicise the proposed bylaw in the locality, consider objections, and ensure that the interference with public rights is reasonable in the interests of defence or public safety. The consent of the Crown Estate Commissioners must also be obtained in relation to any Crown foreshore or sea-bed affected by the byelaws.</p>

Table 13 (continued)

Authority	Regulatory responsibility
Department of Trade and Industry (DTI), Department of Enterprise, Trade and Investment In Northern Ireland (DETI)	DTI is responsible for regulating the exploration and production of oil and gas over the UK Continental Shelf and is also responsible for authorising marine oil and gas pipelines on the continental shelf. DETI issues licences in its onshore area. DTI regulates offshore renewable energy generation, and inshore generation in England including the laying of electricity cables. In Wales, developments under 50MW are administered by the National Assembly for Wales; the Scottish Executive and DETI are responsible for administering wind farm applications in their territorial waters.
Crown Estate	The Crown is regarded in common law as the owner of much of the foreshore and the sea-bed under territorial waters, and for dredging. In Scotland, the Crown also owns coastal salmon fishings and oyster or mussel beds within territorial waters. Where a fish farm affects their rights, a Marine Works Licence is required from the Crown Estate. Licences are granted for minor works and for aggregate dredging on receipt of a favourable opinion following implementation of the Government View consultation procedure. Where the Crown Estate is the owner of the seabed, its permission is required for the laying of cables and pipelines.
Office of the Deputy Prime Minister, National Assembly for Wales, Scottish Executive Development Department, Department of Environment (Northern Ireland)	Overall Governmental responsibility for development planning down to low water mark, including through the issuing of national planning guidance.
Local authorities	Local authorities are responsible for the development of strategic and local development plans and for implementing planning development controls. They are responsible for declaring Local Nature Reserves and for making byelaws to protect these and also to regulate recreational activity in coastal waters. Local authorities also have responsibilities for coastal protection, including through development of shoreline management plans. Local Authority areas of jurisdiction do not generally extend into the sea below the low water mark. In England and Wales, the seaward boundaries of local authorities in general were regulated in 1974 by extending them to the low-water mark of medium tides. The position in Scotland is similar but low water is taken as mean spring tide low water.

427. These responsibilities can be summarised as falling into the categories of i) Strategic and Development Planning, ii) Sectoral Regulation, iii) Integrated Management.

Strategic and Development Planning

428. Much coastal development falls within the Town and Country Planning system and is regulated by local authorities acting under the principles and presumptions set out in strategic and local plans.

Local authorities also have considerable influence over recreational development and activity in their area, and are, therefore, the key regulators in respect to the vital tourism and recreation economic and employment sectors. In general, development control powers extend to low water mark.

Sectoral regulation

429. Historically, much of the regulation of human activity below low water mark has been sector based, with separate Government Departments or statutory agencies responsible for the various sectors, e.g. shipping (Department for Transport), energy (Department of Trade and Industry), naval defence (Ministry of Defence), surface water quality (environment agencies) etc. Where the sector has strong inter-dependencies between its marine and terrestrial elements (e.g. transport, energy supply, defence, surface water quality), this sectoral approach is likely to remain an important factor in determining future governance systems.

Integrated management

430. Integrated Coastal Zone Management is not a statutory requirement in the UK, though the current UK ICZM Stocktake being undertaken by Defra is in part implementation of the EU Communication on Integrated Coastal Zone Management (European Commission, 2002). However, the fact that a number of sectoral regulators (fisheries, water quality, coastal defence and nature conservation) are now overseen by Defra in England and SEERAD in Scotland is preparing the way for much better integration.

Future requirements

431. Previous chapters of this report have concluded that implementation of the draft framework for marine nature conservation will require:

- i. a national and international regulatory system which supports sustainable development in the marine environment;
- ii. strong strategic and spatial planning at the Regional Sea scale, with all regulators participating in plan development and implementation;
- iii. the establishment and conservation of an ecologically-coherent network of important marine areas;
- iv. a range of sectoral and cross-sectoral support measures.

432. In considering what factors should contribute to future governance arrangements, the Pilot would identify the following principles:

- i. to the extent practicable, governance structures should follow strategy;
- ii. governance systems should be cost-effective to administer;
- iii. governance systems should serve the needs of society, and be as simple and efficient as practicable.

433. The strategic goals set out in *Seas of Change* (Defra, 2002b) form the basis of a strategy for the sustainable development of the marine environment and governance systems should seek to parallel this strategy. However, as stated above, certain sectors (transport, energy, defence, surface water quality) have very strong strategic cohesion within their sector, and the links to the strategic

goals for the marine environment may, perhaps, be best considered in the context of strong cross-compliance rather than (structurally) integrated management.

434. The links between fisheries, mariculture, marine pollution and nature conservation, however, are so strong that these sectors lend themselves to integrated management, and the Pilot considers that policy oversight is best delivered by the same Department.

Spatial planning

435. The issue of how to give effect to strategic and spatial planning in the marine environment is a crucial one. In the UK, Town & Country Planning is a terrestrial planning system that is development-plan based. There are 56 local authorities bordering the Irish Sea with differing policies and priorities. Extension of their powers to include ill-defined areas of sea would not be likely to lead to consistency or efficiency in decision-making. The extension of local authority planning beyond the boundary of waters internal to baseline does not appear to offer an integrated solution to spatial planning and development control in the marine environment.

436. Not only is there a need to engage all the relevant UK sectors within a spatial plan, but also there is a need to achieve the participation in spatial planning, at the Regional Sea scale, of adjacent countries.

437. In the light of the foregoing, the Pilot reaches the following conclusions:

- i. there is a need for strong cross-departmental oversight of marine spatial planning to achieve the full collaboration of all Departments, administrations and agencies and to foster collaboration with adjacent countries at the Regional Sea scale. A Cabinet committee might be an appropriate mechanism for this;
- ii. notwithstanding i. above, a single Department needs to take the initiative in ensuring the development of strategic plans at the Regional Sea scale, and of liaising with adjacent countries, working to the principles set out by the Cabinet committee (or other authority exercising this function). In the UK, Defra should be this Department;
- iii. to the extent practicable, regulation of fisheries, mariculture, marine pollution and nature conservation should come within the policy oversight of a single Department;
- iv. all sectoral regulators should be required to carry out their functions in compliance with the Government's strategic goals for the marine environment.

438. In view of the range of current Governmental initiatives currently engaged in reviewing governance and enforcement procedures (in particular the Review of Development in Coastal and Marine Waters) which are expected to address some of the more complex regulatory issues, including development, dredging and disposal consents, the Pilot concentrates its recommendations on the central issue of strategic and spatial planning referred to above.

Recommendations

R59 A Cabinet committee or other cross-departmental authority be established to take over all responsibility for strategic planning in the marine environment and to develop the necessary links with other countries to ensure complementary working at the Regional Sea scale.

R60 In the UK, Defra should take the lead in developing strategic plans for the Regional Seas in full consultation with other UK Government Departments and devolved administrations, and in liaison with relevant other countries.

R61 To the extent practicable, fisheries, mariculture, marine pollution and nature conservation should come within the policy oversight of a single Government Department.

R62 Following completion of the various reviews being undertaken by Government on regulatory procedures and on enforcement in the marine environment, any necessary adjustment be made to existing responsibilities.

16. MARINE NATURE CONSERVATION FRAMEWORK

439. A key objective of the Pilot was to test the Regional Seas approach and, in particular, the draft framework for marine nature conservation (Laffoley *et al.*, 2000). The conclusion from the work of the Pilot is that such a framework is essential to assist in the development of marine policy at the national level and to support the delivery of international obligations. The draft framework was found to be essentially sound but that refinement is needed to the method of operation of its principal elements. This refinement is required both to enable the framework to be implemented in practice and also to set it within the wider context of sustainable development. This Chapter firstly comments on the main components of the draft framework in the light of the work of the Pilot, and, secondly, sets out a refined framework informed by the Pilot's experience.

Experience of the Pilot in relation to the draft framework

440. The Pilot agrees that the 'nested scale' approach utilised in the draft framework is both appropriate and necessary. In relation to the Wider Sea, the Pilot agrees that the main issues to be addressed are improved international and national legislation, enforcement and monitoring. The Pilot considers, in addition, that a framework of strategic and sectoral planning for the sea as a means of delivering sustainable development is needed. Issues relating to long-term environmental change raised by the draft framework are considered by the Pilot as falling within an integrated programme of national marine monitoring.

441. The Pilot confirms the value of the Regional Sea concept as a crucial scale at which to implement sustainable development. The Pilot agrees that existing Regional Sea models used by ICES and OSPAR have limitations for marine nature conservation and for the implementation of sustainable development, including spatial planning. Regional Sea boundaries should be determined having regard to biogeographical factors, and the scheme of Regional Seas proposed by JNCC is a good starting point for further discussion with neighbouring countries. It is recognised that some modification of biogeographical Regional Sea boundaries is likely to be needed to accommodate the practicalities of environmental management and the involvement of regional stakeholders. The Pilot agrees that there is likely to be benefit in developing a number of fora at the Regional Sea scale to support sustainable development.

442. The Pilot confirms both the practicality and value of identifying coastal and seabed marine landscapes, and considers that this approach will have a major future role in relation to the sustainable development of the marine environment, contributing to the environmental assessment of development proposals, the regulation of marine activity, and the implementation of spatial planning. The value of marine landscapes in the identification of an ecologically-coherent network of important marine areas was also confirmed. The Pilot agrees that the identification of water column marine landscapes is a practical proposition but, in relation to the Irish Sea, was not able to determine how the classification could be translated readily into management action, and this aspect needs further work.

443. The draft framework recognised that special measures would be appropriate to protect important marine landscapes and habitats, and that there was a need to ensure the effective protection of a representative range of habitats and species. The draft framework suggested that a system of 'conservation boxes' might be an appropriate mechanism for delivering this requirement. The Pilot has considered this aspect of conservation of important areas in depth and concludes that the concept of an ecologically-coherent network of nationally-important areas is a fundamental component of the marine nature conservation framework. Areas within such a network will need to be conserved effectively through improved legislation, but the issue of 'conservation boxes' will need to be considered further in the context of other potential framework mechanisms, e.g. zoning within a scheme of spatial planning.

444. The draft framework highlighted the need to identify nationally-important marine landscapes, habitats and species and to take the necessary measures to conserve these. The Pilot has confirmed that such nationally-important features can be identified through the application of appropriate criteria, but considers that the conservation of these features will require a combination of measures, some of which will be needed to conserve a wide range of biodiversity features, some of which will need to be highly focused on particular nationally-important features. Further work is needed to identify which features can be supported through generic measures, and which will require specific action. Given the number of features potentially of nationally-important status, the cost-effectiveness of measures will be an important consideration.
445. Finally, the draft framework did not give explicit attention to the conservation of important marine geological and geomorphological features, although it could be expected that such features could be accommodated, at least in part, within the marine landscapes and nationally-important areas elements of the framework. The Pilot has sought to include geological and geomorphological interests within the refined framework.

Refined marine nature conservation framework

446. Taking account of the findings of the Pilot, the following refined marine nature conservation framework is proposed.

The Wider Sea

447. The Wider Sea includes all seabed and overlying waters under UK jurisdiction, together with those of adjacent waters. The main operational considerations are to:
- i. ensure that international policy and legislation supports, and does not frustrate, achievement of the strategic goals set for the marine environment;
 - ii. ensure that financial incentives applied to human activities taking place in, or materially affecting, the marine environment support, and do not run counter to, achievement of the strategic goals set for the marine environment;
 - iii. ensure that human activity is regulated effectively at the national level to achieve the maintenance, or restoration, of good ecological conditions, and the conservation and sustainable use of the marine environment. This system of regulation should include both appropriate legislation and effective enforcement measures;
 - iv. develop a system of co-ordinated marine environmental monitoring, together with the monitoring of human activities, within national waters and, by agreement with countries, also the adjacent waters of neighbouring countries.

The Regional Sea

448. The Regional Sea is an ecologically-meaningful subdivision of the Wider Sea, and is a medium-scale marine ecosystem. Its boundaries will be determined initially having regard to factors of coastal geography, water temperature, depth and currents, but will be adjusted to reflect the use made of the sea by local communities and to accommodate the practicalities of environmental management. The main operational considerations are that the Regional Sea:
- i. provides an appropriate and necessary context for the assessment of marine biological resources, and the physical and chemical processes that these depend upon;

- ii. provides an appropriate and necessary context for the assessment of human economic and social dependency upon the Regional Sea, and the sea's contribution to regional prosperity and quality of life;
- iii. provides an appropriate and necessary context for the involvement of international and national stakeholders and local communities in determining the use made of marine resources at the regional level;
- iv. provides an appropriate and necessary level at which strategic planning and spatial planning will take place in the marine environment. Such strategic and spatial planning should include zoning of human activities so as to avoid damage or disturbance to sensitive areas; measures to ensure the maintenance or improvement of water quality conditions; and measures aimed at maintaining the physical and biological processes that support marine ecosystems, including the maintenance of their trophic structure;
- v. provides the level at which ecologically-coherent networks of marine protected areas are identified.

Marine Landscapes

449. Marine landscapes are small-scale ecosystems or medium-scale marine habitats. In continental shelf waters of 300m or less, they comprise three basic types, namely: i) coastal (physiographic) types, where the seabed and overlying water are closely interlinked; ii) seabed types, where the seabed is somewhat independent of the overlying water except at the substrate/water interface; and iii) water column types, which occur in open water areas above the substrate/water interface. Further investigation is needed to determine whether, in water areas significantly deeper than 300m, the water column types should be further defined in terms of depth. The main operational considerations are that marine landscapes:

- i. provide the broader environmental context for spatial planning, and human activity regulation, across the whole of the Regional Sea and at the local level;
- ii. provide the broad typology of habitat types from which representative examples can be identified to contribute to an ecologically-coherent network of marine protected areas.

Nationally-important marine areas

450. In continental shelf waters of 300m or less, nationally-important areas comprise medium to small areas of the seabed together with the overlying water and water surface. They consist of four main types, namely: i) representative examples of the main marine landscape types; ii) areas of exceptional habitat or species biodiversity; iii) important areas for aggregations of mobile species (e.g. important spawning, nursery, calving, feeding or resting areas, and migration bottlenecks); iv) nationally-important areas for geology or geomorphology. Further investigation is needed to determine whether, in sea areas of considerably greater depth than 300m, a distinction should be made, when determining the boundaries of nationally-important areas, between the seabed and the overlying water or water surface. The main operational considerations are that:

- i. areas are selected on the basis of national criteria and form an ecologically-coherent network for the Regional Sea;
- ii. areas within the network are selected so as to provide ecological or geomorphological support to the other areas, or to adjacent areas of seabed or water;

- iii. regulation of human activity in the areas is proportionate and relevant so as to enable the areas to make their individual and collective contributions to achieving the strategic goals and objectives for marine nature conservation.

Nationally-important marine features

451. Nationally-important features are marine landscapes, habitats or features which have met national criteria in relation to one or more of: proportional importance in a north-east Atlantic or global context; rarity; decline; threat of significant decline. The main operational considerations are that:

- i. features whose distribution is clustered and centred on a small number of distinct localities, or which are aggregated in predictable localities for at least part of the year, will be conserved primarily through the nationally-important areas network;
- ii. species which are mobile, occurring as individuals or in small or even large groups, and which are vulnerable to capture fisheries, should be conserved by special measures regulating such capture;
- iii. species which are vulnerable to disturbance resulting from human-induced noise, vibration or movement, should be conserved by the use of codes or regulations relating to those impacts;
- iv. habitats and species requiring the maintenance or improvement of water quality conditions, or the avoidance of pollution;
- v. where specific local or national action is needed, Action Plans for individual features, or groups of similar features, should be prepared and implemented.

452. Conservation Objectives will need to be set at the levels of the Regional Sea and nationally-important areas. They may also be needed at other levels within the framework where this is appropriate. The marine nature conservation framework will contribute to spatial planning for the Regional Sea by providing environmental information necessary to guide the regulation of human activities and support the strategic goals for the sustainable development of the marine environment.

453. The following recommendation is made in relation to the marine nature conservation framework:

Recommendation

R63 It is recommended that the marine nature conservation framework as set out under paragraphs 447 to 452 of this Report be adopted for use in the UK and promoted with other countries in the north-east Atlantic area.

17. SPECIFICATION FOR FUTURE REGIONAL SEA PROJECTS

454. The Pilot was required, following refinement of the marine nature conservation framework, and learning from experience gained during the Pilot, to set out a specification for the development of a nature conservation strategy for other Regional Seas. This chapter addresses this requirement. The specification set out here is intended to deliver the 'Regional Sea', 'Marine Landscapes', 'Nationally-Important Areas' and 'Nationally-Important Features' components of the framework to the stage where it is effectively complete as a wider nature conservation strategy, and can contribute to the development of a sustainable development strategy for the Regional Sea.
455. In terms of its geographical scope, the specification can be operated at either of two levels, namely:
- i. at the level of UK jurisdiction;
 - ii with the agreement of all the national jurisdictions within the Regional Sea, at the level of the entire Regional Sea.
456. Approximate costs at 2004 prices are provided on the basis of the experience gained in the Irish Sea Pilot at each of the two levels referred to above. Costs are based on those for a moderately complex area such as the southern North Sea. However, actual costs will depend upon the complexity of the Regional Sea selected for the project, and the scale of the project costs of the particular countries participating in the project, which may differ from UK costs. It is assumed that costs relating to sea areas outside UK jurisdiction would be borne by the other participating countries. This is fundamental to a strong partnership and would be an important consideration during the initial planning stages. The timescale for similar work in future should be extended to enable and facilitate dialogue and partnership working with stakeholders, a critical process for objective and target setting for the Regional Sea.
457. In the specification, the assumption is made that work has not been already undertaken to identify and map marine landscapes, nationally-important areas, or to apply the selection criteria to identify nationally-important features, as these relate to the Regional Sea under consideration. If elements of this work have been undertaken, then costs should be reduced accordingly.

Regional Sea specification

458. *Engagement of Regional Sea Governments*

At the outset, there should be discussions with other Governments and devolved administrations having jurisdiction within the Regional Sea area with the aim of developing the necessary partnership, participation and resourcing for implementing a framework.

Estimated cost: £15,000 (UK area only); £20,000 (Regional Sea)

459. *Develop and implement a communication strategy*

- i. in the early planning stages there should be an examination of stakeholder participation needs, to identify and agree with those stakeholders whose participation is essential how best to engage and support their participation and secure their input to, and ownership of, the outcomes. The need to involve or inform wider stakeholders and the general public should also be addressed;
- ii. these requirements should be developed into an agreed and appropriately resourced stakeholder communications strategy, which sets out the participatory and consultative mechanisms which will be employed. The length of time and other resources required to

establish effective partnerships and participatory mechanisms should not be underestimated. This should build-in face-to-face liaison with stakeholders. There will be a need to develop an up-to-date address and email contact list of Regional Sea stakeholders;

- iii. implement a communications strategy as outlined in Chapter 3 of this Report, adapting it to the requirements of the particular Regional Sea and taking account of the above.

Estimated cost: £100,000 (UK area only); £235,000 (Regional Sea)

460. *Data collation and mapping*

- i. with the guidance of experts and sectoral stakeholders, identify and investigate the occurrence, ownership, availability and format of essential datasets, using the guidance set out in Chapter 4 of this Report and Lumb *et al.* (2004a);
- ii. acquire, or gain access, to the available essential data; ensure that staff using the data receive sufficient GIS training and are supplied with sufficient technical support;
- iii. convert the data to GIS format and transfer the information to a dedicated high specification GIS workstation;
- iv. prepare a base map for the coastline and include relevant jurisdictional or other regulatory boundaries;
- v. prepare a map series of key physical, biological, natural resource and human activities as an aid to spatial planning, to assist consideration of further analysis, and for communicating ideas to others.

Estimated cost: £95,000 (UK area only); £200,000 (Regional Sea)

461. *Assess socio-economic context of the Regional Sea*

- i. identify the contributions which the main marine sectors make to the economy and employment of people in the adjacent coastal area to the Regional Sea and identify the likely trends and future prospects of those contributions;
- ii. identify the environmental, social and economic objectives of those sectors in terms of income generation, employment, protection of human health and safety, and protection of the environment;
- iii. identify the dependency of the various marine sectors on the maintenance of ecosystem services.

Estimated cost: £25,000 (UK area only); £60,000 (Regional Sea)

462. *Marine Landscapes*

- i. from the geophysical and hydrographical information, and using the approach set out in Chapter 7 of the Report and in Golding *et al.* (2004), identify a series of coastal (physiographic), seabed and water column marine landscapes for the Regional Sea;
- ii. map the marine landscapes identified, calculate the area of their occurrence within the Regional Sea, and assess their vulnerability to the principal human activities;

- iii. to the extent practical, characterise the marine landscapes biologically from existing information for the Regional Sea or for adjacent areas;
- iv. liaise with experts and sectoral stakeholders, and carry out new surveys where needed, to assess whether marine landscapes identified from geophysical information sufficiently reflect the real situation. To the extent practicable, co-ordinate these surveys with those undertaken to validate important marine areas (see below).

Estimated cost: £75,000 (UK area only); £120,000 (Regional Sea)

463. *Nationally-important marine areas*

- i. using available data, appropriate methods (adapting as necessary those reported in Chapters 9 and 10 of this Report and Lieberknecht *et al.* (2004b), expert and sectoral stakeholder advice, identify nationally-important areas in the following categories: representative examples of the main marine landscapes types; areas of exceptional habitat or species biodiversity; important aggregations of mobile species, nationally-important geological or geomorphological areas;
- ii. develop an ecologically-coherent network of nationally-important areas for the Regional Sea, having regard to the principles summarised in Chapter 9 of this Report, and map this network;
- iii. in the selection of areas and the development of the network, build upon the outcomes of partnership working with stakeholders on nature conservation and sectoral objectives and sustainable development needs.

Estimated cost: £35,000 (UK area only); £75,000 (Regional Sea)

464. *Nationally-important marine features*

- i. using the method reported in Chapter 8 of this Report and in Lieberknecht *et al.* (2004a), develop a provisional Regional Sea list of nationally-important marine features (including marine landscapes, habitats and species);
- ii. map the records of the occurrence of these provisional list features and identify biodiversity hotspots. Contribute this information to the identification of important marine areas as reported above;
- iii. consider whether any of the features on the provisional list would benefit from the development of individual or grouped Action Plans.

Estimated cost: £30,000 (UK area only); £65,000 (Regional Sea)

465. *Conservation objectives*

- i. the conservation objectives developed in Chapter 11 of this report are intended to be applied to UK waters as a whole, and in principle to any of the Regional Seas;
- ii. identify and agree with stakeholders appropriate targets for the conservation objectives relevant at the Regional Sea scale, or to parts of the Regional Sea, which are consistent with achieving sustainable development, meeting international and national commitments and strategic goals, and implementing the ecosystem approach;

- iii. in identifying and agreeing these targets, take account of the environmental, social and economic objectives of the various marine sectors and seek to integrate these objectives as far as possible.

Estimated cost: £30,000 (UK area only); £50,000 (Regional Sea)

466. *Integrating nature conservation with sustainable development*

- i. from consideration of the work on marine landscape vulnerability, the nationally-important areas network, and the information collated on the use of the Regional Sea, and impact upon it of human activities, develop a draft zoning plan for the Regional Sea;
- ii. carry out a consultation on the zoning plan and discuss its implications with the other marine sectors. Identify, jointly with stakeholders, the main constraints preventing the integration and achievement of environmental, social and economic objectives and opportunities. Consider and seek agreement between stakeholders on how these constraints might be overcome, for example, through greater integration of sectoral activities and objectives, increasing the sustainability of individual activities and identifying the levels of protection which may need to be applied to various parts of the Regional Sea, including nationally-important areas for conservation of marine biodiversity;
- iii. in the light of views received, revise the zoning plan and identify management measures needed to achieve the conservation objectives and the best fit with sustainable development;
- iv. interpret the zoning plan for each of the main marine sectors, having regard to the particular nature of the environmental impacts generated by the various sectors;
- v. promote the zoning plan and management measures with the European Commission, Governments, sector regulators and sector industries.

Estimated cost: £80,000 (UK area only); £165,000 (Regional Sea)

467. On this basis, the total cost is estimated at **£485,000 (€695,000)** for that part of the Regional Sea lying within the United Kingdom's designated area, and **£990,000 (€1,415,000)** for the whole of the Regional Sea including that part lying within the jurisdiction of neighbouring countries.

468. In practice, there may be benefit in seeking to achieve the agreement of countries in the north-east Atlantic area on the key standards (for example on the suite of marine landscapes, and on the criteria and methods for the identification of nationally-important features and areas) at an early stage of this work. In terms of the development of such standards and methods, there would be benefit in selecting, as a priority, a Regional Sea of quite different character from the Irish Sea for future work, for example one of the Regional Seas to the west or north of Scotland. However, other considerations, such as the need to engage other European countries actively in the process, or urgent conservation need, may dictate the timetable for future work.

18. COMPLETING THE MARINE NATURE CONSERVATION FRAMEWORK FOR THE IRISH SEA

469. As a result of the refinement of the marine nature conservation framework, and the specification for future regional sea projects, reported in previous chapters, it is possible to draw up and cost a suggested programme of work needed to complete the framework for the Irish Sea.

Draft Framework for Marine Nature Conservation

470. *Further engagement of Irish Sea stakeholders*

- i. discussions should be held with the Governments of Ireland and the Isle of Man on the work to be undertaken to complete the framework, the responsibilities for carrying out the various elements, and on how the work is to be financed;
- ii. an evaluation of the needs of stakeholders for participation in the further elements of work should be agreed and an appropriate communication strategy should be developed and implemented. Existing contact lists should be updated and enhanced as necessary.

Estimated cost: £45,000

471. *Data collation and mapping*

- i. identify key gaps in the data, and identify data sources to fill them, acquire the data, and enter it on the GIS.

Estimated cost: £30,000

472. *Assess socio-economic context of the Regional Sea*

- i. identify the high level objectives of the main marine sectors and regulatory infrastructure in terms of income generation, employment, protection of human health and safety, and protection of the environment;
- ii. identify the dependency of the various marine sectors on the maintenance of ecosystem services.

Estimated cost: £40,000

473. *Marine Landscapes*

- i. undertake any needed refinement to the existing work, including defining zones of high natural productivity.

Estimated cost: £15,000

474. *Nationally-important areas*

- i. complete the work to develop a draft ecologically-coherent network of nationally-important areas for the Irish Sea;
- ii. seek expert and sectoral stakeholder advice and involvement in developing the draft network, identifying the areas of flexibility in site selection, seeking views on where area selection would assist individual sectors, and on how the network would affect the sectors;

- iii. revise the network of nationally-important areas to provide the best fit between i. and ii. above.

Estimated cost: £35,000

475. *Nationally-important features*

- i. carry out any necessary refinement of the Provisional Irish Sea List to remove features unlikely to meet the agreed criteria, and re-map the known occurrence of these features;
- ii. consider whether any of the features would benefit from the development of individual or grouped Action Plans.

Estimated cost: £20,000

476. *Conservation objectives*

- i. identify and agree with stakeholders appropriate targets for the 'generic' conservation objectives already proposed (or more specific conservation objectives where necessary) to individual marine landscapes or to nationally-important areas;
- ii. in developing the objectives and targets, there should be close liaison with sectoral stakeholders to seek to ensure that the objectives and targets are consistent with achieving sustainable development, meeting international and national commitments and strategic goals, and implementing the ecosystem approach.

Estimated cost: £30,000

477. *Spatial planning*

- i. carry out the work specified for this element in the 'Specification for future Regional Sea Projects' set out in Chapter 17.

Estimated cost: £65,000

478. The total cost of completing the marine nature conservation framework for the Irish Sea is estimated at **£280,000 (€400,000)**. This assumes an overhead rate of 80% of staff costs; this is a higher overhead rate than was applied for the work undertaken under the Pilot reflecting in part the anticipated somewhat higher costs of work in Ireland.

Development of a Marine Spatial Planning System

479. Chapter 12 concluded that there was a need for a comprehensive system of marine spatial planning at the national, Regional Sea and local levels, suggested a set of guiding principles for this, and a hierarchy of planning guidance and plans. In their report, David Tyldesley and Associates recommended a programme of work to take these ideas forward which included:

- i. an investigation into how such a marine spatial planning framework would operate in practice and how it would relate to international regulatory mechanisms outside 12n miles; and,
- ii. a trial of the process recommended as a result of this investigation on the Irish Sea (building on the work of the Irish Sea Pilot), and, drawing on the experience of this trial, the development of detailed proposals for a statutory national framework and mechanisms for international collaboration.

The report indicated that this programme of work could be carried out over a period of 2-3 years, and might cost in the order of **£750,000 (€1,000,000)**.

480. This programme of work could be undertaken in conjunction with that described above for completing the marine nature conservation framework for the Irish Sea, which would inform its conclusions, at a total cost of ca **£1 million (€1.45 million)**.

Identification of external funding sources to assist completion of the framework for the Irish Sea and a Marine Spatial Planning System

European Union

481. There are 4 possible funding instruments that could be used to support marine projects in general and specifically the work on the Irish Sea. These are summarised briefly below with comments on their potential application. However, the current funding arrangements conclude in 2006 and the funding framework beyond 2006 is still to be determined.

Regional structural funds

482. These are under discussion at present and a new proposal is expected to emerge in February 2004. The current areas with Objective 1 and 2 status do not cover large areas of sea and these funding streams are not likely to be appropriate for further work in the Irish Sea or other Regional Seas.

Interreg III

483. Interreg III is a Community initiative which aims to stimulate inter-regional cooperation in the EU between 2000-06. It is financed under the European Regional Development Fund and is a financial instrument for spatial planning related initiatives. This phase of the Interreg initiative is designed to strengthen economic and social cohesion throughout the EU, by fostering the balanced development of the continent through cross-border, transnational and inter-regional cooperation. Special emphasis has been placed on integrating remote regions and those which share external borders with the candidate countries.

484. Interreg III is made up of 3 strands A, B and C and has a total budget of €4.875 billion (1999 prices):

- i. Strand A: aims to develop cross-border social and economic centres through common development strategies, and is focused on co-operation between adjacent regions;
- ii. Strand B: aims to promote better integration within the Union through the formation of large groups of European regions; it is focused on trans-national co-operation involving national, regional and local authorities;
- iii. Strand C: aims to improve the effectiveness of regional development policies and instruments through large-scale information exchange and sharing of experience (networks), it is focused on inter-regional co-operation.

485. Interreg programmes cover a number of sea areas separately including North West Europe, the North Sea and the Irish Sea. Interreg 111B is the most likely regional policy financial instrument to be applicable to marine or regional sea management.

The LIFE III programme

486. The European Commission has proposed the extension of the LIFE III programme beyond 2006. There are expected to be two more calls for projects in 2004 and 2005:

- i. LIFE Nature: supports actions aimed at conservation of natural habitats and the wild fauna and flora of European Union interest, in accordance with the Birds and Habitats Directives. It supports implementation of the nature conservation policy and the Natura 2000 Network of the European Union;
- ii. LIFE-Environment: supports actions which aim to implement the Community policy and legislation on the environment in the European Union and candidate countries. This approach enables demonstration and development of new methods for the protection and the enhancement of the environment.

487. UK agencies have used both Life Nature and Life Environment for marine projects; for example, Life Nature funded the European marine site programme, and BioMar, while Life Environment was used for some ICZM projects. Life Environment would appear to be the most suitable instrument for funding ecosystem-based initiatives at the Regional Sea scale.

Financial Instrument for Fisheries Guidance

488. There is expected to be pump priming funding for the establishment of Regional Advisory Councils (RAC) under the 2002 Common Fisheries Policy (CFP). Currently, a small number of large RACs are proposed to cover European seas and the remit is advisory only. Even at this scale, Member States have responded that the proposed budget is not adequate. European Parliament proposals now under discussion for stronger RACs with a wider management remit at a Regional Sea scale would require even greater funding. Therefore, it is rather too early to know if RAC could make any significant contribution to regional sea management in general.

Conclusion

489. Interreg 111B and Life Environment are the most likely European funding options for Regional Sea scale projects arising from the Irish Sea Pilot. The major break in EU funding streams at the end of 2006 suggests that action should be taken urgently to prepare projects in 2004 to take advantage of these options.

Recommendation

490. The following recommendation is made in relation to completing the marine nature conservation framework for the Irish Sea:

R64 Resources should be sought from the relevant national jurisdictions and statutory agencies, and from the European Union, to complete the work identified in this report in relation to the marine nature conservation framework for the Irish Sea, and to develop detailed proposals for a comprehensive marine spatial planning framework following a trial of initial proposals on the Irish Sea.

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APPENDIX 1

IRISH SEA PILOT STEERING GROUP

Organisation represented:

Associated British Ports/British Ports Association
Centre for Environment, Fisheries and Aquaculture Science (CEFAS)
Countryside Council for Wales/JNCC
Crown Estates
Department of Agriculture, Fisheries and Forestry, Isle of Man
Defra (Chair)
Duchas, Government of Ireland
Environment Agency
Environment and Heritage Service/Department of Environment, Northern Ireland
Local Government Association
Marine Conservation Society/Joint Links
National Federation of Fishermen's Organisations
North Western and North Wales Sea Fisheries Committee/Association of Sea Fisheries Committees
Scottish Executive
Scottish Fishermen's Federation
Wales Coastal and Maritime Partnership
Welsh Assembly Government

In attendance:

Defra Secretariat
JNCC Project Director
JNCC Pilot Team

APPENDIX 2 IRISH SEA PILOT - JNCC STAFF CONTRIBUTING TO THE PROJECT

Dr Malcolm Vincent	Project Director	Part time
Dr Steve Atkins	Pilot Team Leader	Full time
Mr Chris Lumb	Pilot Team Senior Officer	Full time
Ms Karen Birleson	Pilot Team administration	Part time
Mr Mike Webster	GIS support	Part time
Mr Matthew Davies	GIS support	Part time
Mr Neil Golding	Marine Landscapes	Part time
Ms Louise Lieberknecht	Nationally-important features and areas	Part time
Mr Andy Webb	Seabirds and cetaceans data	Part time
Dr Ian Mitchell	Seabird Colony data	Part time
Mrs Carol Soar	Report preparation	Part time

JNCC Data Services staff acquired and installed the computer hardware and software for the Pilot Team.

JNCC Financial Services staff carried out services in relation to the letting of contracts and financial management.

JNCC Personnel Services managed the Pilot Team recruitment and provision of staff support.

JNCC Geological Conservation Review staff managed the earth science contract.

JNCC Communications staff managed the website and the report publication.

English Nature provided accommodation and related support to the Pilot Team at its Kendal office.

APPENDIX 3 IRISH SEA PILOT - COMMISSIONED WORK

Contact	Contract	Cost to nearest £100
Anatec UK Ltd	Collation of shipping and related data	1,800
BMT Cordah Ltd	Collation of coastal information	4,100
British Geological Survey	Seabed data licence	200
Josie Carwardine	Application of Marxan to biological data.	4,200
CEFAS	Inventory of relevant CEFAS datasets	3,400
David Tyldesley Associates/ W S Atkins	Applying spatial planning to the marine environment	11,400
Department of Agriculture and Rural Development/Queen's University, Belfast	Marine survey to validate marine landscapes	13,150
Frances Dipper	Preliminary study into available datasets	2,700
Global Charting Services	Data on submarine cables	1,100
Marine Biological Association	Information search on selected habitats and species	10,700
Marine Biological Association	Marine landscape sensitivity analysis	9,600 ¹
Marine Biological Association	Application of nationally-important features criteria	5,000 ³
Nature Bureau	Conservation objectives	5,800
Posford Haskoning Ltd	Collation of socio-economic statistics	7,000
Sea-Scope: Marine Environmental Consultants	Collation and conversion of datasets	9,600
Sir Alastair Hardy Foundation for Ocean Science	Analysis of plankton data for marine landscapes	3,000
University of Hull - Institute of Estuarine and Coastal Studies	Summary of maritime legislation and regulation	11,000
University of Liverpool - Centre for Marine and Coastal Studies, Port Erin Marine Laboratory	Summary of Isle of Man Legislation	11,500 ²
University of Wales, Bangor	Identification of biological samples	2,450
University of Wales, Bangor - Centre for Applied Marine Science	Conservation of marine geoscience sites (rationale and methods)	19,600 ³
University of Wales, Bangor - Centre for Applied Marine Science	Identification of important Irish Sea geoscience sites	13,400 ⁴
University of York - Environment Department	Marine conservation measures	9,900
VT Ocean Sciences	Marine survey to validate marine landscapes	18,800

¹ 50% paid by JNCC

² 50% paid by IoM Government

³ 100% paid by JNCC

⁴ 25% paid by Countryside Council for Wales, 25% by Environment and Heritage Service, 12½% by Isle of Man Government

APPENDIX 4 REFINED CRITERIA FOR IDENTIFICATION OF NATIONALLY-IMPORTANT MARINE FEATURES

Criteria

Proportional importance

A high proportion of the marine landscape, habitat, or population of a species (at any time of its life cycle) occurs within the UK. This may be related to either the global or regional extent of the feature.

Features may be categorised as follows:

Globally important: a high proportion of the global extent of a marine landscape or habitat, or a high proportion of the global population of a species (at some stage in its life cycle), occurs within the UK. 'High proportion' is considered to be more than 20%, when known.

Regionally important: a high proportion of the regional extent of a marine landscape or habitat, or a high proportion of the regional population of a species (at some stage in its life cycle), occurs within the UK. 'Regional' refers to the north-east Atlantic (OSPAR) area, 'High proportion' is considered to be more than 30%, when known.

Rarity

Marine landscapes, habitats and species that are sessile or of restricted mobility (at any time in their life cycle) are considered nationally rare if their distribution is restricted to a limited number of locations. Rarity can be assessed as a feature which occurs in fewer than 0.5% of the total number of 10km x 10km squares in UK waters.

A mobile species qualifies as nationally rare if the total population size is known, inferred or suspected to be fewer than 250 mature individuals. Vagrant species should not be considered under this criterion.

Decline

An observed, estimated, inferred or suspected significant decline (exceeding expected or known natural fluctuations) in numbers, extent or quality of a marine landscape, habitat or a species in the UK (for species, quality refers to life history parameters). The decline at a global or regional level, where there is cause for concern that the proportional importance criterion will be met within the foreseeable future.

Decline in extent and quality of features at different scales should be assessed as shown in the following table:

	Extent	Quality
Marine landscapes and habitats	A marine landscape or habitat that has declined in extent to 90% or less of its former natural extent in the UK, or its distribution within the UK has become significantly reduced (e.g. lost from several sub-regions).	A marine landscape or habitat for which quality, based on change from natural conditions caused by human activities, is negatively affected by: <ol style="list-style-type: none"> i. a change of its typical or natural components over a significant part of its UK distribution, or ii. the loss of its typical or natural components in several sub-regions. Such judgement is likely to include aspects of biodiversity, species composition, age composition, productivity, biomass per area, reproductive ability, non-native species and the abiotic character of the habitat.
Species	Within the UK population of the species: <ol style="list-style-type: none"> i. there has been a recent significant decline in number of individuals/geographical range; or ii. numbers of individuals/geographical range are presently in marked decline; or iii. the present population is at significantly lower levels than in the past as a result of human activity (evidence for past significant decline). 	The species has suffered a significant decline in one or more of the following: <ul style="list-style-type: none"> • loss of genetic diversity • loss of fecundity • reduction in the number of mature individuals • fragmentation of the population

Threat of significant decline

It is estimated, inferred or suspected that the feature may suffer significant decline (as defined under the 'decline' criterion) in the foreseeable future as a result of human activity. This assessment will need to take into account sensitivity, vulnerability and probable exposure to the effects of human activity.

A feature may also qualify under this criterion if there is real cause for concern that it would fulfil the proportional importance criterion in the near future due to the threat of severe global or regional decline.

Generic guidance on the application of the criteria for nationally-important marine features

'Feature' refers to species, habitats and marine landscapes. Species are relatively well defined units for carrying out the assessment. Habitats and marine landscapes are broader units which are not as tightly defined, and therefore may give rise to confusion about how to define and delimit the units for assessment.

Habitats, in the context of nationally-important marine features, do not refer to one, fixed, level of scale (such as a defined level in the marine habitat classification). It is recommended that the assessment should initially be carried out at the (relatively broad) biotope complex level. If the biotope complex level does not meet any of the criteria, but more narrowly defined biotopes within the complex do, then those biotopes should be listed as nationally-important. This may be the case, for example, with the 'sublittoral mussel beds' biotope complex (SMus), which includes widespread types dominated by *Mytilus edulis* as well as *Modiolus modiolus* beds. SMus may not qualify as nationally-important, but *M. modiolus* beds would qualify under the threat and decline criteria and should therefore be listed.

Marine landscapes are considered to be broad units which should not be too tightly defined in terms of their biology. For example, sealochs in Scotland differ in their biota from sealochs in other parts of Northern Europe, because of biogeographical factors. Too tightly defined marine landscapes would, therefore, always qualify under the proportional importance criterion. However, marine landscapes should only qualify under this criterion if similar functional types are rare outside the UK - this could be the case for fjardic sealochs. Biologically-defined features should not be assessed at this scale.

‘National’ refers to the boundary of UK jurisdiction, e.g. the assessment of whether a feature meets any of the criteria is carried out using a political boundary, and features which qualify are deemed ‘nationally-important’ at the UK level. However, existing datasets will usually cover a range of different local, regional or biogeographical areas, and judgements will often have to be carried out using datasets that cover only part of the UK seas, or which also include areas of adjacent waters outside UK jurisdiction.

Further guidance is provided in Lieberknecht *et al.* (2004a) and online at www.jncc.gov.uk/irishseapilot.

APPENDIX 5: CRITERIA FOR THE IDENTIFICATION OF NATIONALLY IMPORTANT MARINE AREAS

1. **Typicalness:** the area contains examples of marine landscapes, habitats and ecological processes or other natural characteristics that are typical of their type in their natural state.
2. **Naturalness:** the area has a high degree of naturalness, resulting from the lack of human-induced disturbance or degradation; marine landscapes, habitats and populations of species are in a near-natural state. This is reflected in the structure and function of the features being in a near-natural state to help maintain full ecosystem functioning.
3. **Size:** the area holds large examples of particular marine landscapes and habitats or extensive populations of highly mobile species. The greater the extent the more the integrity of the feature can be maintained and the higher the biodiversity it is likely to support.
4. **Biological diversity:** the area has a naturally high variety of habitats or species (compared to other similar areas).
5. **Critical area:** the area is critical for part of the life cycle (such as breeding, nursery grounds/ juveniles, feeding, migration, resting) of a mobile species. The assessment needs to evaluate the relative importance of the area for the species. An area for which a species has no alternative should receive a greater weighting than an area where a species has a range of alternatives for the aspect of its life cycle (e.g. is a given gravel bank the only one for a herring population to spawn on?). This will vary according to species and the part of the life cycle in question.
6. **Area important for a nationally-important marine feature:** features that qualify as special features or which are declined or threatened should contribute to the identification of these areas. The assessment should consider whether such features are present in sufficient numbers (species), extent (habitat) or quality (habitats, marine landscapes) to contribute to the conservation of the feature.

Further guidance is provided in Lieberknecht *et al.* (2004b) and online at www.jncc.gov.uk/irishseapilot.



The Joint Nature Conservation Committee (JNCC) is the forum through which the three country nature conservation agencies - English Nature, Scottish Natural Heritage (SNH), and the Countryside Council for Wales (CCW) deliver their statutory responsibilities for Great Britain as a whole - and internationally. The Committee consists of representatives of these agencies, as well as the Countryside Agency, independent members, and non-voting members appointed by the Department of the Environment, Northern Ireland.

The JNCC was established under statute by the Environmental Protection Act 1990 and commenced its work in April 1991.

Details of publications produced by JNCC are available from:
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